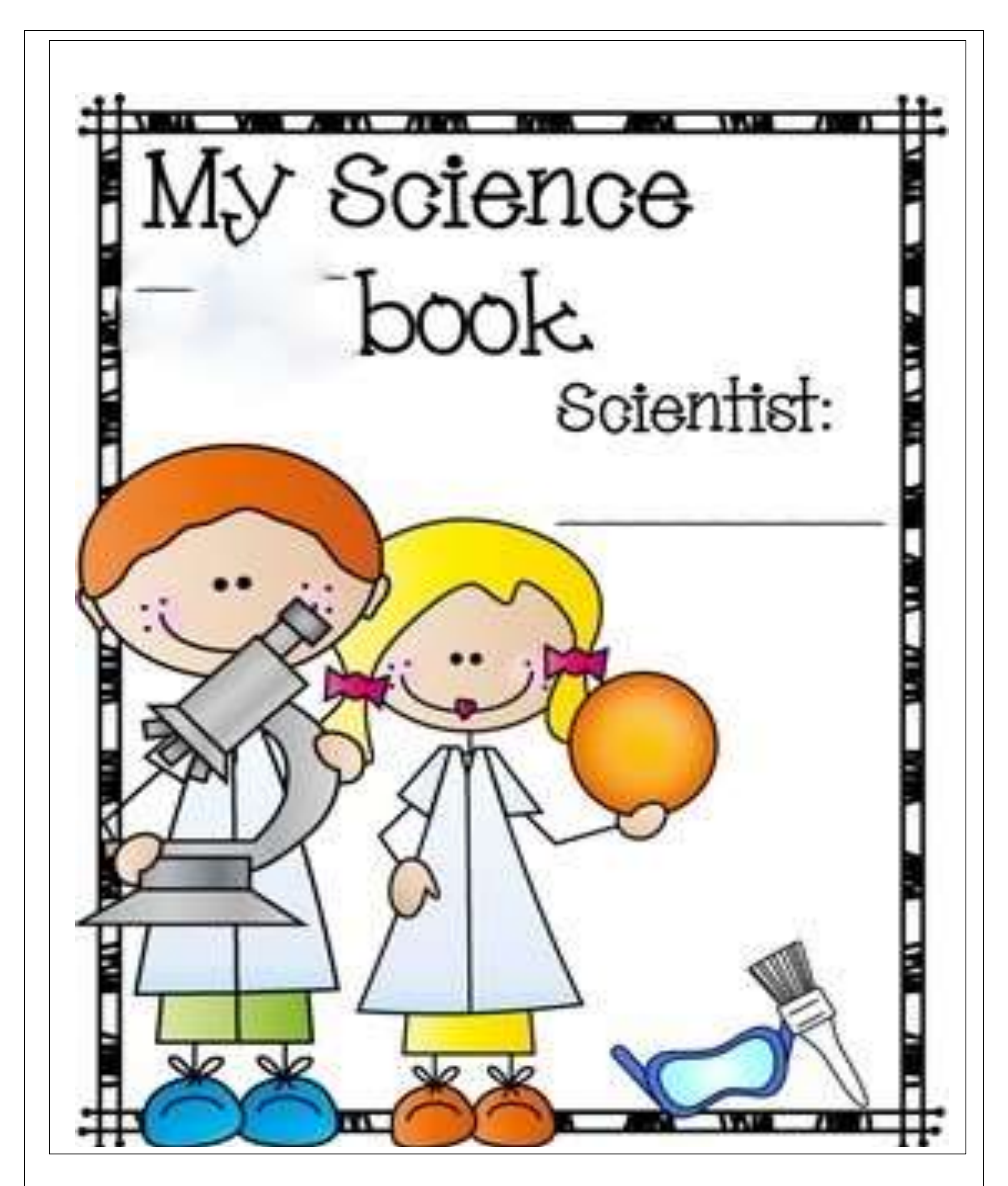
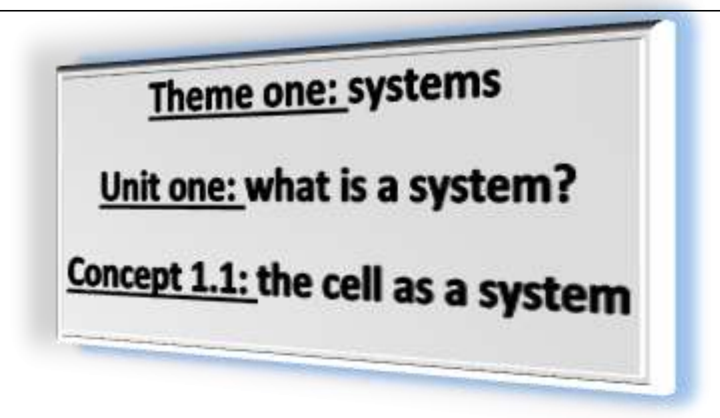
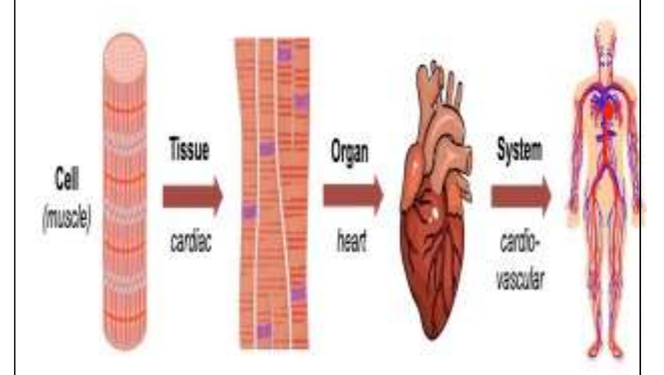


Grade 6 First Term

2023\2024



The cell: it is the main building unit of the living organism's body that carries out all its vital activities



*cells:

1) found only in living organisms only

2) Tiny particles cannot be seen by naked (unaided) eyes

3) Their length range between 0.1 mm _0.005 mm) so we need **"microscope"** to see them

* some cells may be large such as **unfertilized egg**

***bacteria's body consists of 1 cell with length less than (0.005 mm)**

***Cell biologists:** are scientists who study cells

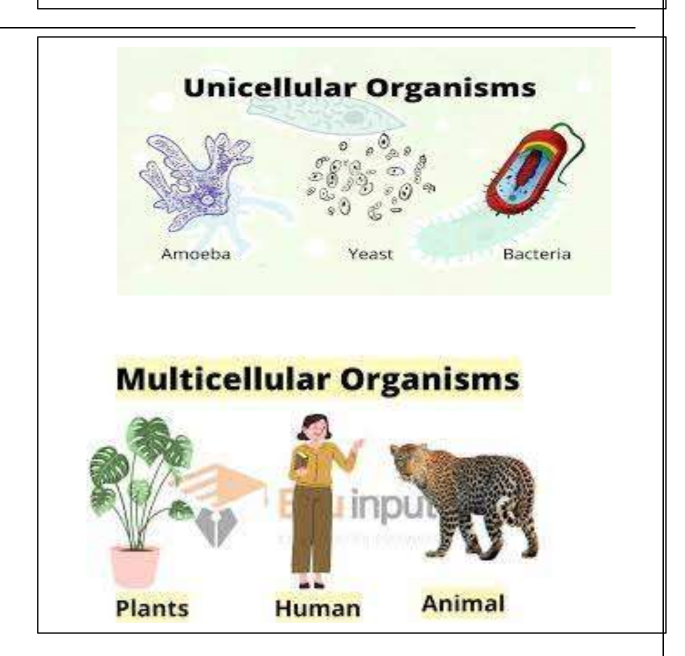
4) Cells don't grow in **size** but increase in **number**



There is living organisms have

1) Many cells as (human, plant, animals)

2) One cell as (Bacteria)



Characteristics of cells:

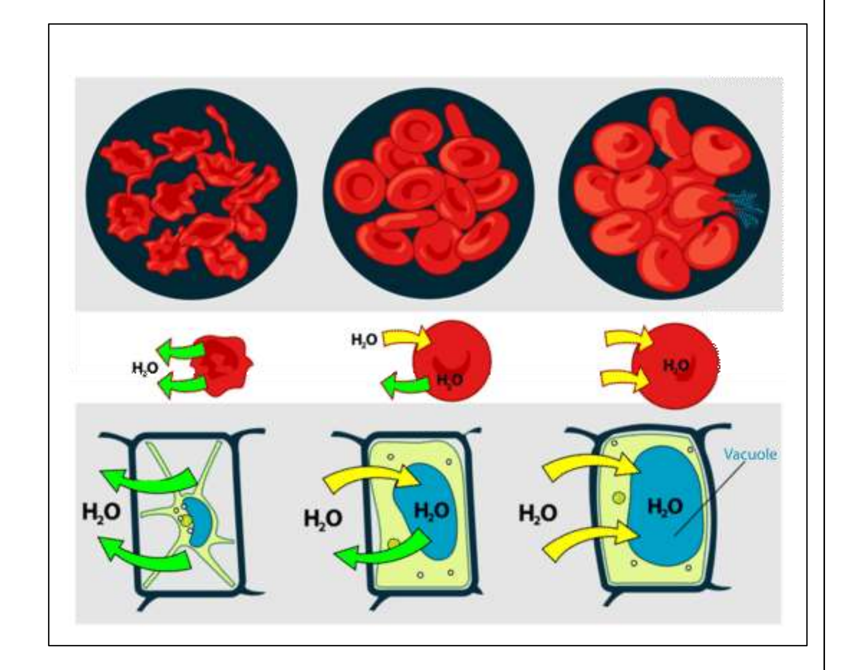
1. **All cells have cell membrane**
2. **Not all cells have a cell wall**
   cell wall found in plant cell not animal
3. **Not all cells have a nucleus**
4. **The cell of one living organism aren't identical**

Cell needs:

1. **Food (nutrients) and oxygen??**
   to get energy
2. **Water??**
   to stay alive

***water enters the cell through (cell membrane) it allows water to enter and leave the cell**

If there is much water enter the cell it will swell until it bursts



Class work sheet

Choose:

1. The smallest tiny structures that build up all living organism's bodies are………
   1)systems 2)cells c)organs d)bricks
2. The structure(s) found in plant cell and not found in animal cell
   1)cell membrane only 2)cell wall only
   3)cell membrane and nucleus 4)cell wall and nucleus
3. Growth of a living organism is resulted from increasing the……of the cells in body
   1)length 2)size 3)number 4)mass
4. All the following living organisms bodies are buildup of many cells , except……
   1)human 2)fish 3)plant 4)bacteria

Write the scientific term:

1. The component of cell that allows water to enter and exit the cell
   (……………………….)
2. A device that is used to see the structure of living organisms cells
   (……………………….)

Give reason for:

1. The cell needs energy
   ……
2. The cell allows water to go outside it
   ……

Put (t) or (f)

1. We can see he cells of all living organisms with naked eyes ( )
2. All animal cells have a nucleus ( )
3. The cell gets its energy from nutrients only ( )
4. The cells that build up a fish body are similar to that of onion plant ( )

Home work sheet

Complete:

1. Plant cell has…………………which is not found in animal cell
2. Your body grows up due to the increase in number of your body………………………
3. All cells allow water to go inside and outside them through………………….
4. To see the structure of a bacteria, we need to use……………………….

Put (t) or (f)

1. All cells have a cell wall in their structure ( )
2. The cell membrane allows water to enter and exit from cell ( )

Write the scientific term:

1. The main building unit of the living organisms body that can do all vital process (…………………………)

What happen if:

1. There is much water enters the cell
   ……
2. The cell doesn't get its needs of nutrients, oxygen and water
   ……..

Give reason for:

1. We need to use a microscope to see the body of bacteria
   ……

Lesson 2

Microscope was invented in the 17th century

Robert Hooke used his microscope to see parts of plant that cannot be seen by eyes

(the cell)

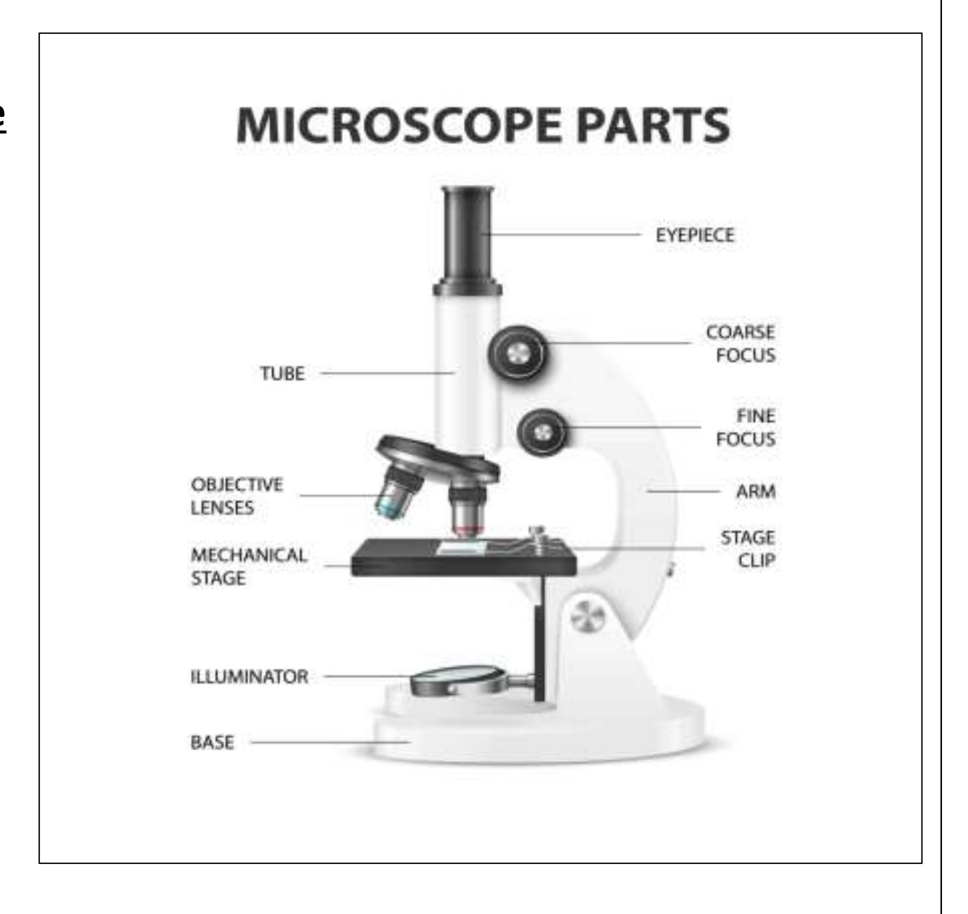
1665 – Robert Hooke

- Produced a compound microscope
- Saw hollow boxes and named them "cells"



Structure of the microscope

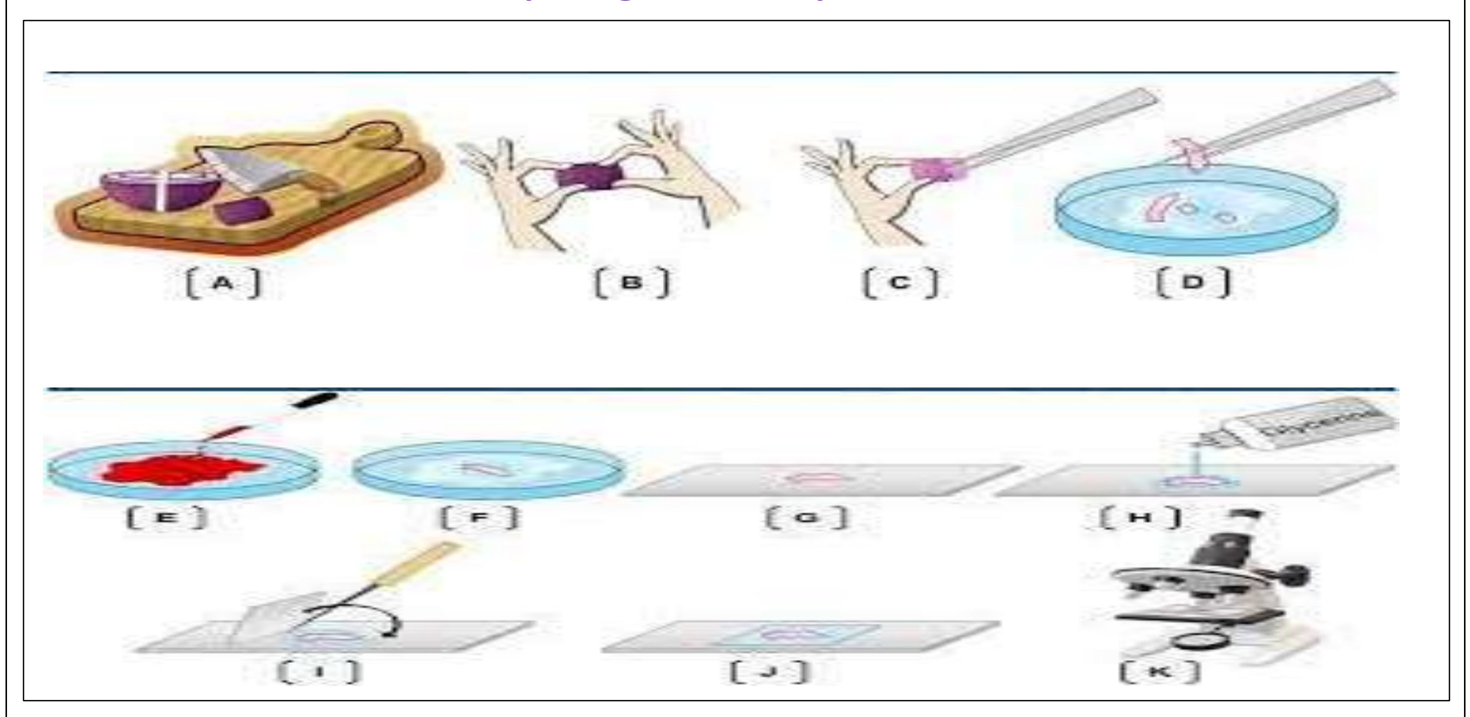
1. Eyepiece
2. Tube
3. Coarse focus
4. Fine focus
5. Arm
6. Objective lenses
7. Stage
8. Stage clip
9. Mirror(illuminator)
10. Base



Objective lenses have different focusing power

to allow us see the components of the cell

Preparing a slide of plant cells:



1) Put slide on the stage and fix it with stage clip
2) Use suitable objective lens
3) Rotate coarse focus and fine focus **to see clear image**



***Low power objective lenses** see the cells in small size

***High power objective lenses** see the cells in bigger size

Class work sheet

Choose:

1. Microscope help scientist to discover that ……….. is the building unit of living organisms bodies
   1)brick 2)cell 3)the sun 4)energy
2. You can see the cells of all the following under microscope except…………
   1)onion 2)human skin 3) leaf 4)stone
3. All the following are from parts of microscope, except……………
   1)eyepiece 2)stage 3)coverslip 4)mirror
4. The body of simple living organisms as bacteria consists of …………..
   1)one cell only 2)different cells
   3)many cells 4)ten cells only

Give reasons for:

1. Scientists tend to use microscope in their researches
   ……………………………………………………………………………………………………….
2. We must rotate coarse focus and fine focus during examination a sample under microscope
   ………………………………………………………………………………………………………..

What happens if:

1) Scientists was not invented the microscope
   ……

Home work sheet

Complete:

1) Robert Hooke named the tiny particles that he saw under his microscope with …………………..
2) The cell is the building unit of ………………………..bodies
3) You can see cells of an examined sample in small size by using the ……………objective lens of microscope

Write the scientific term:

1) The device that Robert Hooke used to observe the cells of the plant parts (……………………….)
2) The objective lens of microscope which allow us to see the samples in bigger size (………………………)

Correct the underlined words:

1) The coarse focus and <u>stage</u> of microscope are used to make the image of the examined sample clear (……………………..)
2) Growth of living organisms bodies happens by increasing the <u>size</u> of the cells that make up their bodies (……………………..)

Give reason for:

1) Robert Hooke used a microscope to observe the cells of plant parts
……

Lesson 3

The parts of a cell

Living organisms are divided into:

Unicellular organisms	Multicellular organisms
Their bodies consists of **one cell only**	Their bodies consist of **many cells**
Bacteria 	Humans Animals Plants
	

Structure of multicellular organisms bodies:

1. Similar cells : there is different shapes of animal cells

Forms

2. Tissues: each tissue is often composed of similar cell do the same function

Forms

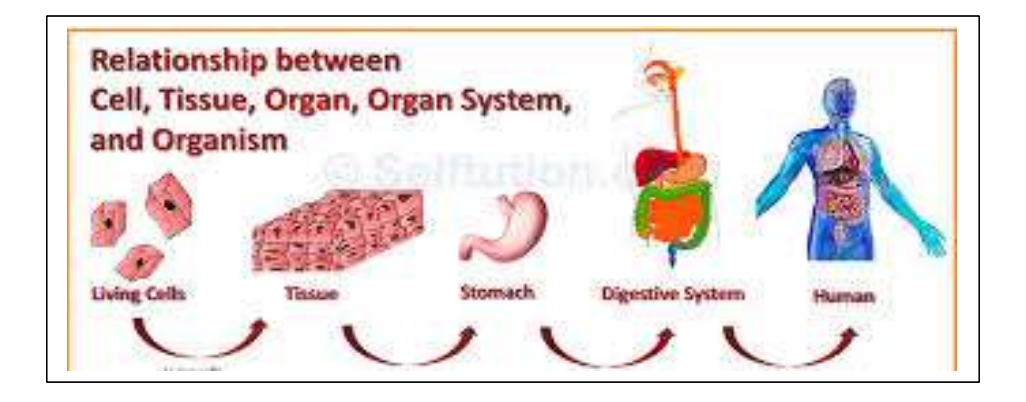
3. Organs: each organ composed of different tissues to do its own function

Forms

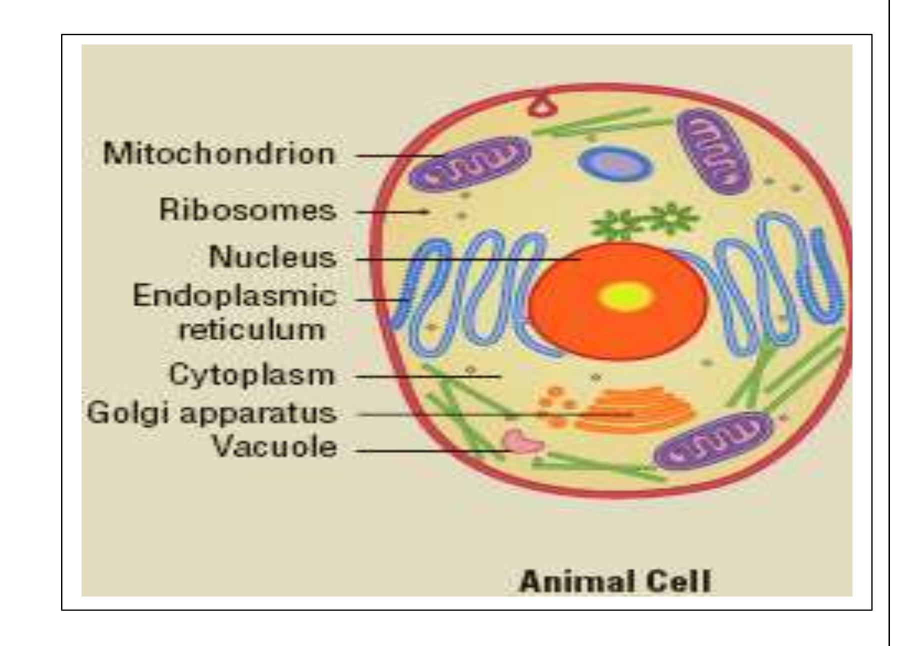
4. Systems: each organ composed of different organs to do certain function

Forms

5. The whole body: it contains **40 trillion= 40,000,000,000,000 cell**



Parts of animal cell:



1. **Nucleus:**

   it is often located at the center

Function:

it controls all vital activities

 * formation of protein

*cell division to form new cell

2. **Cell membrane:**

   it is the outer lining of cell

Function:

* it protects the cell

*it has selective permeability feature: it allows some substance to enter and prevents some from leaving

3. **Mitochondria:**

   one of organelles that known as **(powerhouses)**

Function:

*provide the cell with energy by converting sugar inside the cell into energy through cellular respiration

cellular respiration: process takes place inside the mitochondria, where oxygen is used to obtain the chemical energy stored in food **to help the cells make their functions**

4. **Cytoplasm:**

   it is the gelatinous (thick) liquid inside the cell

Function:

*all other cell parts float in it

5. **Endoplasmic reticulum:** one of organelles

Function:

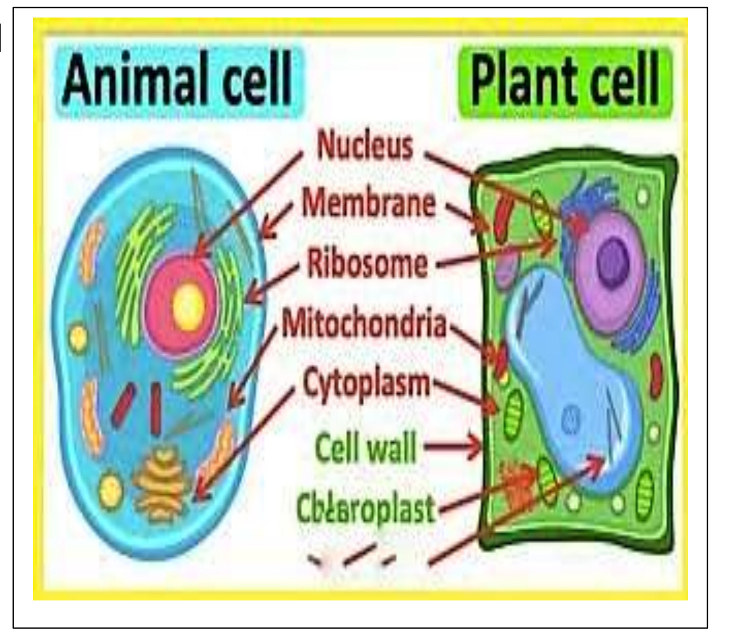
*it helps in assembling and transporting proteins inside the cell **to build and repair the cell**

6. **Golgi apparatus:** one of organelles

Function: helps in packing and transporting different materials between the cells and out

There is difference between animal cell and plant cell

1. **Plant cell is surrounded by (cell wall) made up of <u>cellulose</u>**
2. **Plant cell contains chloroplasts that help plant to make its own food by photosynthesis process**



<u>Organelles:</u> they are tiny structures inside the cell and each type of them has a special function

<u>Cell organelles:</u>

mitochondria
Golgi apparatus
endoplasmic reticulum
vacuoles
chloroplasts

Class work sheet

Choose:

1. All the following organisms are examples of multicellular organisms, except…………
   1) human 2) horse 3)bacteria 4)apple tree
2. Stomach is composed of a group of different…………………
   1)bacteria 2)systems 3)organs 4)tissues
3. All the following parts are from the main parts of animal cell, except……….
   1)cell membrane 2)cytoplasm 3)cell wall 4)nucleus
4. The gelatinous liquid which is found inside the cell is known as…………
   1)nucleus 2)cytoplasm 3)cell membrane 4)organelles
5. Plant cell has the ability to make the photosynthesis process due to the presence of……………inside it
   1)mitochondria 2)chloroplasts 3)nucleus 4)cytoplasm
6. The 2 cell organelles which are responsible for transportation process are…………
   1)mitochondria and Golgi apparatus
   2)endoplasmic reticulum and Golgi apparatus
   3)endoplasmic reticulum and mitochondria
   4)mitochondria and chloroplasts

Write the scientific term:

1. They are living organisms that their bodies consist of one cell only (…………………………)
2. It is a gelatinous liquid which is found inside the cell (………………………….)
3. They are cell organelles that provide the cell with the needed energy (………………………)

Give reasons for:

1. Cats are considered as multicellular organisms
   ……
2. Plant cells can make photosynthesis process
   ……

Home work sheet

Complete:

1. Human is considered as……………………….. organism
2. Muscle tissue is composed of a group of…………..that do the same function
3. Cellulose makes up…………..which is found in…………cells only
4. Plant cell similar to animal cell in the presence of………………..and………………

Put (t) or (f)

1. Bacteria and dog are considered as multicellular organisms ( )
2. Chloroplasts are found in the cells of banana plant leaves ( )
3. The cells of monkey are surrounded by cell wall from outside ( )
4. All cell parts which are found inside the cell are floating in cytoplasm ( )
5. Tissues are composed of different type of organs ( )
6. The cell wall is made up of cellulose ( )

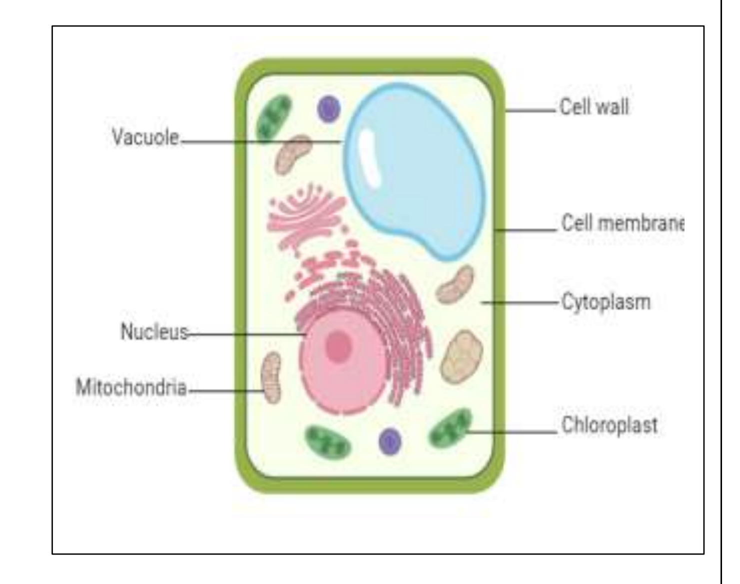
Give reasons for:

1. Bacteria are unicellular organisms
   ……..
2. Plant cells can make photosynthesis process
   …….

Write the scientific term:

1. They are living organisms that their bodies consist of many cell
   (……………………)
2. It is the structure that surrounds the animal cell from outside
   (…………………….)

Lessons 4+5



Parts found in plant cell only:

1. Cell wall:

*Is made of cellulose
*it is rigid external material surrounds the cell membrane of the plant cell
Function: it give the plant cell definite shape

2. Chloroplast:

*they are sac contains tiny green granules??
As they contain green pigment called chlorophyll
Function: chlorophyll absorbs the sunlight for plant to make its own food through photosynthesis process

3. Sap vacuole:

*plant cell has only one **big** sap vacuole
Function: it stores nutrients, water and waste materials inside the plant cell

---



1) Animal cell has many small vacuoles
that store nutrients, water and wastes inside animal cell

2) Animal cell doesn't have cell wall
so it doesn't have definite shape

3) Animals have other structures to keep their shapes
*some have bones (cats, dogs and birds)
*some have hard shell like cover **(exoskeleton)** to give them their shapes as insects

Compare between animal cell and plant cell

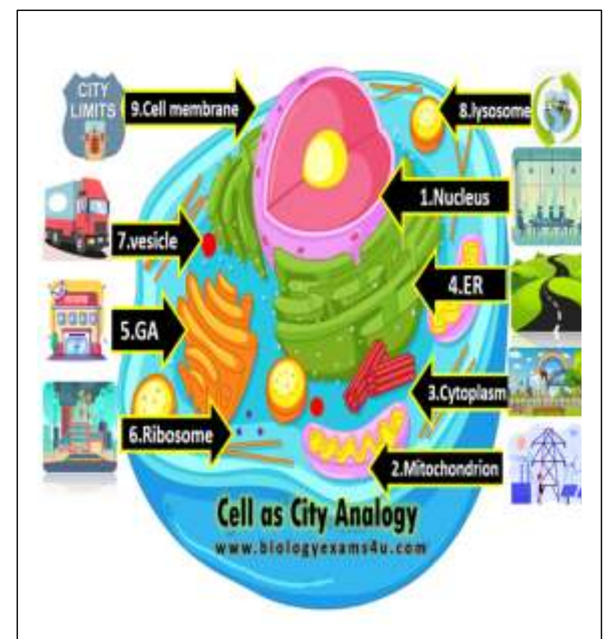
points	plant cell	Animal cell
definition	Main building unit of plant's body	Main building unit of animal's body
Cell membrane	present	present
Nucleus	present	present
mitochondria	present	present
Golgi apparatus	present	Present
Endoplasmic reticulum	Present	Present
vacuole	One big sap vacuole	Many small vacuole
chloroplasts	Present	Absent
cell wall	Present	Absent
cytoplasm	Present	Present

Build a cell city

The cell as a system looks like a city that has different buildings and structures to carry out the needed functions of the city

Nucleus ________________ city hall
Cell membrane __________ guard at city gates
Mitochondria _____________electrical power station
Endoplasmic reticulum ______construction workers
Golgi apparatus ______________post office
Vacuole _________________store house
Chloroplast (plants only) _________food factory

Cell wall (plants only) ______stone wall surrounding the city



Class work sheet

Complete:

1) Cell wall is made up of ………………….. and give plant cell its definite……………
2) The presence of ……………………. Pigment gives most plants their green color
3) The body of the bird has …………………that give this bird its definite shape
4) Plant contains one big …………………..that stores water, nutrients ant wastes

What happen if……?

1) The animal cell is surrounded by the cell wall
   ……….
2) There is no chloroplasts in plant cells
   ……

Put (t) or (f)

1) Cell wall surrounds the cell membrane of animal cells ( )
2) There is one big vacuole in the cell of onion plant ( )
3) Exoskeleton gives some insects their shapes ( )
4) Cats can make its own food due to the presence of chloroplasts in its cell ( )

Give reasons for:

1) Plant cell has a definite shape
   …….
2) Vacuoles act as storehouses in cities
   …….
3) Chlorophyll absorbs the energy of the sunlight
   ……….

Label the following figure:

a) ………………………
b) ………………………
c) ………………………
d) ……………………….
e) ……………………..
f) ……………………..
g) ……………………..

Home work sheet

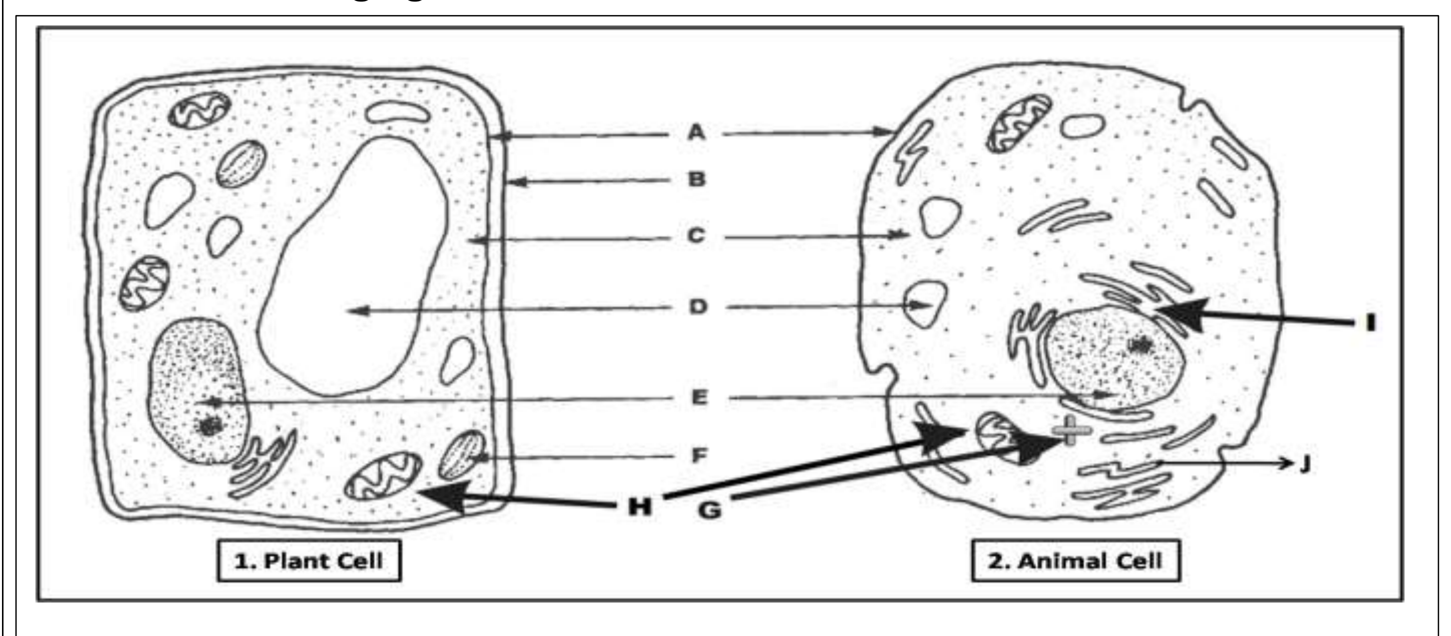
Choose the correct answer:

1) All the following can be stored inside sap vacuole of plant cell, except………………
   a)energy b)nutrients c)water d)waste material
2) Cellulose forms…………….. of plant cell
   a)cell membrane b)cell wall c)chloroplast d)sap vacuole
3) All the following animals have bones in their bodies, except……………..
   a)cats b)dogs c)birds d)insects
4) Structure found in plant cell and not found in animal cell…………………
   a)nucleus b)Golgi apparatus c)cell membrane d)cell wall

Write the scientific term:

1) It surrounds the plant cell to give it a definite shape (……………………….)
2) They are sac contains tiny green granules (……………………….)
3) It is a green pigment that absorb the sunlight energy (……………………….)

Label the following figure:



A. ………………………………………….
B. ………………………………………….
C. ………………………………………….
D. …………………………………………..
E. …………………………………………..
F. …………………………………………..
I. ……………………………………
H. ……………………………………
J. ……………………………………..

Lesson 6



Stem in action

<u>Record Evidence like a scientist:</u>

1. **The question**
2. **Claims:** answer for the previous question
3. **Evidence:** mention evidence that support your claim
4. **Scientific explanation:** should explain claims and evidence

---



1. cells are very tiny (diameter of animal cell= 0.001 cm)
2. Cell biologists use microscope **to** magnify cells (seem larger)
3. Cell biologists work in **laboratories** and do experiment to study how cells work and respond to different variables
4. Some of Cell biologists work with doctors **to** know how cell repair body parts
5. Some cell biologists work in agriculture **to** study plant cell

- **<u>Cells are usually colorless (clear) so it is hard to see their structure under microscope</u>** so they use different dyes to add color
- **<u>Methylene blue dye</u>** helps to see the nucleus as a blue area
- **<u>Scientists built 3D microscope</u>** (see top, sides and layers of cell) **<u>to help</u>**
  1) **Cell biologists'**
  2) **doctors:** to treat cancer

Class work sheet

Complete:

1) Cell biologists use………………….. to magnify cells of bacteria
2) Cell biologists work with……………………. to watch how cells can work to repair the human body
3) The 3D microscope can help……………………… Learn more about how cells divide
4) To see the nucleus of a cell under microscope, we can stain the cell with ………………

Put (t) or (f)

1) Cells very large as the diameter of an animal cell is about 0.001 cm ( )
2) Cells are usually clear, so it is easy to see their structure under microscope ( )
3) The 3D microscope can help doctors to treat cancer disease ( )

Give reason for:

1) We must stain cells before examining them under microscope
   ……
2) Some cell biologists work with doctors
   ……

Home work sheet

Choose:

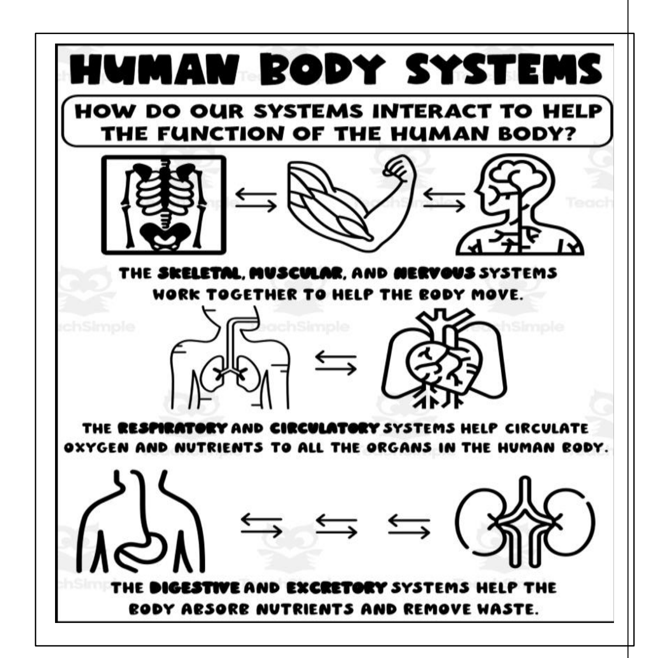
1) Cell biologists use microscopes to magnify……………..to appear larger
   a) stones b)bricks c)cells d)rocks
2) To see the structure of a cell under microscope we must color it by using ………
   a)stains b)water c)sunlight d)vinegar
3) Methylene blue dye helps us to see the…………….of the cell as a blue area under microscope
   a)cytoplasm b)Golgi apparatus c)chloroplast d)nucleus

Write the scientific term:

1) A stain that is used to color the nucleus of the cell in blue color (…………………………..)
2) The microscope that helps us to see the top, sides and layers of the cell (………………………..)

Concept 1.2

The Body as a system



Different systems in your body interact and work together

- **There is interaction between nervous system and circulatory system**
  your heartbeats increase when you feel nervous
- **Interaction between digestive and skeletal system**
  digestive provide the skeletal with nutrients to grow
- **The interaction between circulatory system and muscular system and nervous system**
  is important in dangerous situations
- **All systems interact (work) together in dangerous situation**

- **Digestive system digests food (nutrients)**
- **Nutrients transmitted to nerve cell through blood in circulatory system (to do its function)**
- **Nervous system controls muscles of stomach and heart (to do their functions)**

Classwork sheet

Complete:

1. When you feel nervous, there is an interaction between circulatory system and……………….system
2. When you smell a fire smoke, the…………………. sends a message to your leg muscles to walk toward the fire location
3. The interaction between…………………..is important in any dangerous situation
4. Nutrients are transmitted from digestive system to nervous system through the…………..in the circulatory system
5. Digestive system provides the nerve cells with…………. which are needed to perform their functions

Put (t) or (f)

1. All systems work together in an integrated way ( )
2. In a dangerous situation, nervous system only allows your body to face the danger ( )
3. Digestive system can digest food without the help of nervous system ( )
4. Muscles of heart are controlled by nervous system ( )

Give reason for:

1. Digestive system helps skeletal system in fracture healing ……….
2. The importance of nervous system for the muscles of heart ………..

Correct the underline word

1. <u>Digestive</u> system controls the muscles of heart (………………………..)
2. When your eyes see a dangerous situation, the <u>heart</u> sends a signal to the muscles to contract (……………………..…..)

Homework sheet

Choose:

1. When you feel nervous, your heartbeats increase, this indicate the interaction between……………………….systems
   a)digestive and nervous b)nervous and circulatory
   c)nervous and circulatory d)digestive and respiratory
2. Skeletal system takes nutrients from………… system for growth of muscles
   a)circulatory b)digestive
   c)nervous d)respiratory
3. Muscles of stomach and muscles of heart can be controlled by ………………… System
   a)digestive b)circulatory
   c)nervous d)respiratory
4. The nerve cell depends on ……………..systems to get their needed nutrients
   a)digestive and respiratory b)digestive and circulatory
   c)circulatory and respiratory d)circulatory and nervous
5. In dangerous situations, ……………………
   a)all system interact together
   b)circulatory system interact with digestive system only
   c)nervous system sends message to digest food in stomach
   d)respiratory system interacts with circulatory system only

Give reason for:

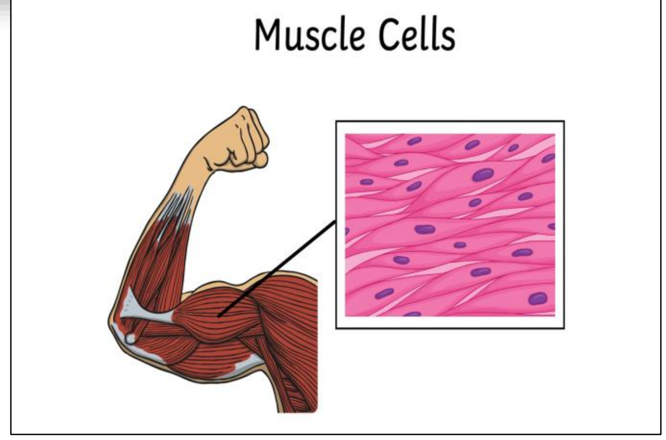
1. The nerve cells in the nervous system need nutrients
   ………

Use the following systems to complete:

(Digestive system, Circulatory system, Nervous system)

1. Controls the muscles of stomach ………………………………..
2. Transmits nutrients from digestive system to the nerve cells ……………………….
3. It provides the muscles of heart with its needed food ……………………………

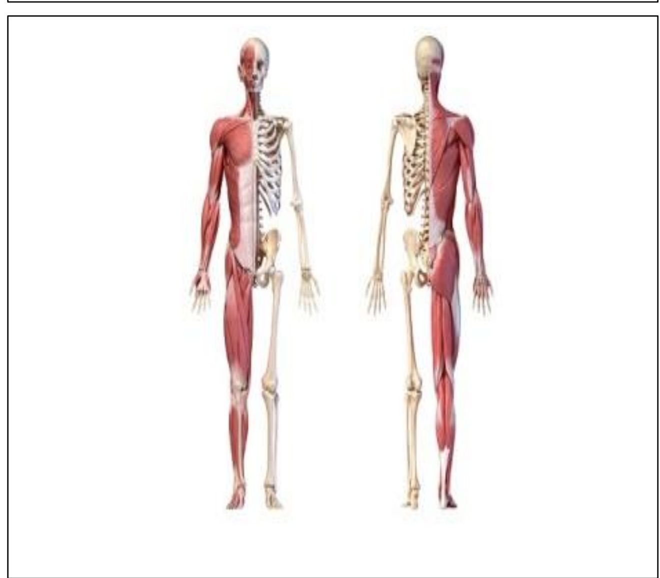
Lesson 2



***From cell to tissue**

Muscle cell:

- In the form of Long fiber??
  to allow movement
- Store and use energy quickly
- They are small cells so, they don't work alone
- They are bundled (collected) to form tissues



***From tissue to organ**

- Bundles are organized to form **muscle**
- **Muscle** considered an organ

***From organ to system**

- Each system is a group of organs that perform specific function

Example:

Musculoskeletal system:

It is formed of 2 systems (muscular system+ skeletal system) work together to allow move

It consists of: 1) Bones 2) muscles 3) ligaments 4) tendons 5) cartilages

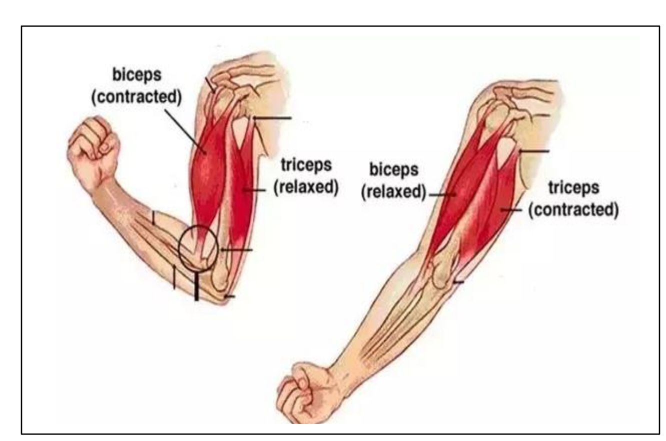
Moving muscles

*your arm moves due to **contraction** and **relaxation** of muscles connected to bones of the arm

*Forearm moves up (in front of upper arm contracts Muscles in the back relaxes) and the opposite

*Muscle can only exert force when it contracts

*Contraction of muscle moves in **one direction only**



Classwork sheet

Complete:

1. The body consists of group of……………. which consists of a group of organs
2. The skeletal muscles can store and use…………………..quickly
3. Bundles of muscle tissue are organized to form the…………………………..
4. Musculoskeletal system consists of 2 systems which are…………………system and…………………system that allow the …………………..of the body
5. When muscle contracts it can exert…………………………..

Give reason for:

1) Muscle cells are in the form of long fibers

………

2) Skeletal system cannot do the function of movement without muscular system

………

Write the scientific term:

1) They are cells in the form of long fibers to allow movement

(……………………………….)

2) The system which helps the body to move

(……………………………….)

3) They are muscles that attached to the bones of skeletal system

(…………………………….)

Homework sheet

Choose the correct answer:

1. Cells differ from each other in……………………….
   a)shapes b)sizes only c)shapes and sizes d)neither shapes nor size
2. All the following are from the characteristics of muscle cells , except that they
   a) are in the form of long fibers
   b)can work alone due to their large sizes
   c)must be able to store and use energy quickly
   d)can be bundled together to form tissues
3. The muscle is considered as……………………….
   a) a cell b)a tissue c)an organ d)a system
4. Among the organs of musculoskeletal system are………………..
   a) muscles and bones of arm b)muscles of arm and lungs
   c)bones and heart d) lungs and heart
5. Musculoskeletal system allow the body to……………………
   a)digest food
   b) move from place to another
   c)transmit nutrients
   d)exchange oxygen and carbon dioxide
6. Your leg moves due to contraction and relaxation of……………..connected to the bones of leg
   a)hairs b)toes c) skin d)muscles
7. The contraction of muscles moves the bones in……………..only
   a) one direction b)two direction
   c)three direction d) four direction

Put (√) or (×):

1. A group of different tissues can form a system (…….)

2. Muscle cells are in the form of long fibers to allow movement (…….)

3. Muscle cells can't store and use energy quickly (…….)

-Give reasons for:

1- **Muscle cells don't work alone**

………

Lesson 3

Types of muscles

Involuntary muscles	Voluntary muscles
They are muscles that move **automatically** **Cannot control** their movement	They are muscles that you **can control** their movement
Examples: *Cardiac muscle Contracts and relaxes without stopping to **allow** the heart pumps the blood carrying oxygen to all body cells *Eye muscle Muscle contract when you close your eyelid **to allow** you blink many time in one minute without thinking	**Examples:** Skeletal muscle *upper arm muscles (**bend**= in front of upper arm **contracts** and in the back of upper arm **relaxes**) (**straighten**=in front upper arm **relaxes** and in the back of upper arm **contracts**) *neck muscle *forearm Abdomen muscles 2 important abdomen voluntary muscles on each side of your body called **waist muscles**
Heart Muscles	Skeletal Muscle smooth muscle cells

***All muscles work by contraction**

***when a pair of skeletal muscles perform action, one muscle contracts, while the other muscle relaxes**

Systems work together

Endocrine system	Circulatory system	Respiratory system
It Consists of glands that secrete hormones?? To respond in different situations	Consists of heart muscle and blood vessels (arteries +veins+ bloodcapillary) that allow blood flow through the body	Consists of lungs, diaphragm and airways (trachea and bronchi)
It controls the body temperature and blood pressure	**It transports blood, gases, nutrients and hormones(secreted by endocrine system)**	**It provides the body with oxygen gas and gets rid of carbon dioxide gas**
Role in danger: Releases hormones to fight the danger or to run away from it as: • Contraction of muscles • Increasing heart beats • Increasing of breathing rate	**Role in danger:** Pumps blood quickly around the body carrying oxygen, nutrients and hormones to cells • Blood pressure increases	**Role in danger:** Provides different organs with oxygen such as muscles and brain • **Breathing increases** • **Heartbeats increases** to allow the body to send more oxygenated blood to muscle and brain

Classwork sheet

Complete:

1. Muscles of eyelid that allow you blink many times in one minute are considered as………………muscles, while the muscles that help your eyeball to move in different directions are considered as…………………muscles
2. All muscles can do the function of movement by…………………
3. The lungs release the air that rich in……………..gas
4. Endocrine system consists of…………………which secrete…………………
5. The muscles of the heart are called……………………..

Write the scientific term:

1. They are muscles that you can control their movement (…………………………….)
2. It is the system which consists of the heart and blood vessels that allow blood to flow through the body

Give reason for:

1. Cardiac muscles are considered as involuntary muscles
   ……
2. When the body faces a danger, the heartbeats increase
   ……

Put (t) or (f)

1. The heart begins to beat quickly during normal situations (………)
2. Blood transports oxygen gas only to all the body organs and tissues (……..)
3. Forearm muscles are considered as voluntary muscles (……..)
4. Cardiac muscles are considered as voluntary muscles (………)

Homework sheet

Choose the correct answer:

1. Among the muscles which you cannot control their movement are……….
   1)hand muscles 2)eyelid muscles 3)leg muscles 4)arm muscles
2. Circulatory system can transport all the following substances through all the body parts, except……….
   1)nutrients 2)gases 3)hormones 4)bones
3. Among the organs which belong to respiratory system is……………………
   1)heart 2)stomach 3)lung 4)brain
4. Cardiac muscles are type of voluntary muscles which form the…………………….
   1)heart 2)intestine 3)lungs 4)stomach
5. The system that helps the respiratory system in transporting oxygen gas from lungs to all the body organs is the……………..system
   1)digestive 2)nervous 3)endocrine 4)circulatory

Put (t) or (f)

1. Heart is made of a type of involuntary muscles (……..)
2. When the heartbeats increase, the blood pressure increases also (……..)
3. Cardiac muscles contract and relax all the time without stopping (…….)

Give reason for:

1. Cardiac muscles contract and relax without stopping
   ……..
2. The muscles that surround the eyeball are considered as voluntary muscles
   ………

Write the scientific term:

1. It is the system that consists of lungs and other airways (……………………………….)
2. They are muscles that you can control their movement (……………………………….)

Lesson 4+5

The human body systems need energy from food to do their functions

Digestive system converts the **complex food** into **simpler substance** that body can use for energy and growth

Digestion process

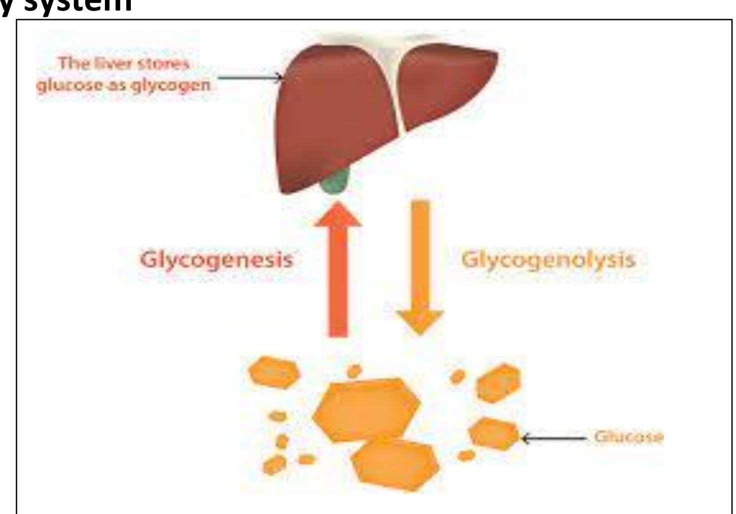
It starts with mouth

1. **Chewing** break food into smaller parts to help **chemicals** secreted by **endocrine** system **to digest food**
2. **Saliva** (contains enzyme) easily soften the food and begins the chemical breakdown of food
3. **Swallow** the food muscles push it down to esophagus then to stomach
4. **Stomach's digestive fluids** contain **acid** and **some enzymes** leads to more food breakdown
5. **Pancreas** and **gallbladder** secret enzymes that help in chemical breakdown of food once it moves into **small intestine**
6. The wall of the small intestine absorb these nutrients through blood vessels to carry them to all body parts (absorption of nutrients starts in small intestine)
7. The undigested food passed to **large intestine (colon)** as soupy mixture
8. Large intestine absorbs most water from undigested food that leaves the body as solid mass (**feces or stool**)
9. **Rectum** the last part that stores feces until leave the body
10. Feces leave the body through **anus** (muscular opening at the end of the rectum)

Transporting nutrients

Through circulatory system

- Some nutrients are stored as sugar and fats
- **Liver** and **muscles** store **glucose sugar** and convert it to **glycogen**
- **Liver** and **muscles** convert **glycogen** into **glucose sugar** again and release it when we need **energy**



The excretory system

It is the system that is responsible for storing and getting rid of waste materials produced from the cells

- **Excretion process**: Important vital process inside the body that collects and removes the waste materials
  *If the body doesn't get rid of waste it get sick
  *The digestive system doesn't share in excretion process
  blood cells and proteins are too large to pass through nephron so they stay in the body

Parts responsible for excretion process

skin	Respiratory system	Urinary system
sweat waste leaves the body through pores in skin	Exhale Gets rid of carbon dioxide	It removes waste materials from the blood in the form of urine

Urinary system

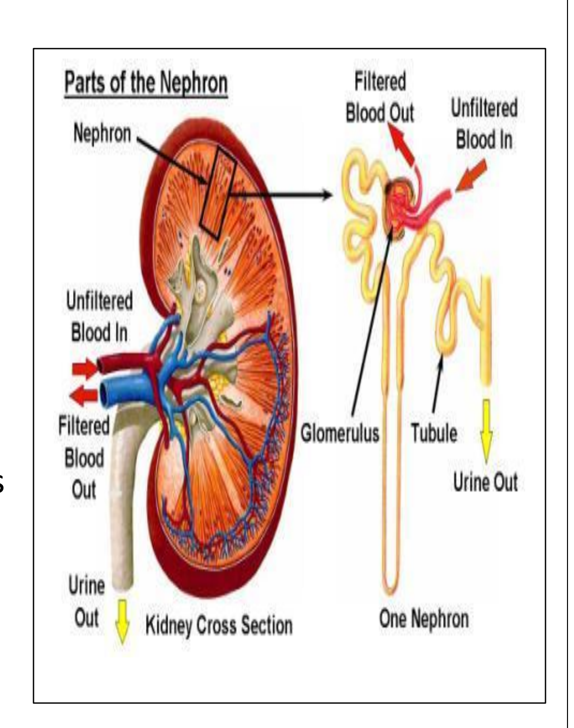
Urination: expelling urine from body

it consists of

1) 2 kidneys 2) ureters 3) Bladder 4) urethra

Two kidneys: clean and filter the blood up to 300 times

- Artery brings blood to kidney
- Nephron (microscopic filter) filters and removes harmful substances from the body
- Urea is waste materials formed due to breakdown of proteins and removed by kidneys
- After filtering is completed urea, water and other wastes become urine
- Urine leaves through ureter and collected in bladder
- Urine leaves the body through urethra



Class work sheet

Choose:

1. You can use your ………….muscles to help the teeth chew the food
   a) eye b)cardiac c) jaw d) hand
2. Absorption of nutrients inside the body starts in the …………… organ
   a) large intestine b) small intestine c)heart d)stomach
3. Engineers design special devices to work instead of ………………..organ which filter the blood from waste materials
   a) Stomach b) heart C)kidney d) lung

Put (√) or (×).

1) The digested food enters the colon as a soupy mixture ( )
2) When your body needs energy , liver and muscles convert glycogen into glucose again ( )

Write the scientific term

1) An organ in which absorption of nutrients starts (…………………..)
2) It is the process of expelling urine from the body (…………………..)

Give reason:

1) Walls of small intestine contain blood vessels
…….

2) Blood cells and proteins cannot pass through the kidney's nephrons
………

What happens if?

1) Your body doesn't get rid of waste
……

Homework sheet

Choose:

1) The part of large intestine which stores the feces until it leaves the body is the…………….
   a)rectum b)colon c)esophagus d)anus
2) The tube which transports the urine from the kidney to the bladder is the
   a) vein b)urethra c)ureter d)artery
3) The two kidneys remove waste materials as …………., and expel them in the form of urine
   a) water & urea b) urea & blood cells c)water & proteins d) proteins & blood cells

Put (√) or (×).

1) Kidney is considered as a filtering system for the blood ( )
2) Proteins can pass through nephrons during filtration of blood in the 2 kidneys ( )

Give reason:

1) Formation of urea inside the body of human
…….
2) The liver and muscles convert the stored glycogen into glucose sugar
………

What happens if?

1) Pancreas & gallbladder don't secrete their enzymes in small intestine
……

Write the scientific term

1) The system that is responsible for excretion of carbon dioxide gas (…………………..)

Complete:

1) Respiratory system removes ………………….gas from the body as a waste product
2) People whose kidneys are not working well , their …………………..cannot be filtered well

Lesson 6 + stem

Pancreas organ of endocrine system that produces insulin hormones with right amount to **regulate the sugar level in blood**

Insulin hormones: regulates the amount of sugar that body use for energy

If pancreas doesn't do its function correctly people will infected by **diabetes disease**

Diabetes disease

It is disorder of endocrine system (people are unable to make or use insulin so sugar stays in blood)

Diabetics must give themselves regular shots (doses) of insulin

Insulin pump is a device attached to the body to help **diabetics** control the blood sugar levels with automatic injections of insulin

Researchers develop an artificial pancreas (internal organ that pumps insulin as needed) so diabetics don't need external pump

Classwork sheet

Choose:

1) Diabetes disease occurs due to a disturbance in one organ of …………………system
   a) respiratory b) nervous c) endocrine d)urinary
2) People who suffer from diabetes can use the insulin pump device that injects the body automatically with ……………….
   a) sugar b) water c)insulin d)carbohydrates

Put (√) or (×):

1) The body uses sugar to get its needed energy ( )
2) Pancreas secretes hormone to regulate sugar level in the blood ( )
3) If pancreas cannot do its function correctly, the sugar level in the blood ( )

Write the scientific term:

1) The organ that is responsible for regulating the sugar level in blood (…………………………)
2) A hormone that controls the level of sugar in the human blood (…………………………)
3) A disease that is resulting from the disorder of secreting insulin hormone by pancreas (…………………………)

Complete:

1) People that have a problem in secreting insulin will be infected by……………………..disease
2) Pancreas is one of the organs of ………………system that produces ……………… Hormone
3) Researchers are working to develop an artificial ……………………to pump insulin internally inside the human body

What happens if?

1) Pancreas doesn't make its function correctly
   ....

Homework sheet

Choose:

1) The organ which is responsible for secreting insulin hormone is the …………….
a) gallbladder b)pancreas c)liver d)stomach

2) Pancreas belongs to…………….. system and its secretions help in completing ……………………. Process
a) endocrine – digestion b)circulatory – respiration
c)digestive – urination d)endocrine – sensation

3) Insulin hormone is responsible for regulating the level of …………………..in blood
a) water b) fats c) proteins d)sugar

Put (√) or (×):

1) Diabetes disease is one of the disorders of the respiratory system ( )

2) The insulin pump device helps diabetics control the water level in the blood with automatic injection of insulin ( )

3) Researchers are working to develop an artificial pancreas instead of the insulin pump Device ( )

Write the scientific term :

1) The system which helps in regulating sugar level in the blood by secreting a specific hormone (……………………..)

2) A device that is used by diabetics to help them control the blood sugar levels with automatic injections of insulin (………………...)

Give reason:

1) Diabetics must give themselves regular shots of insulin
…….

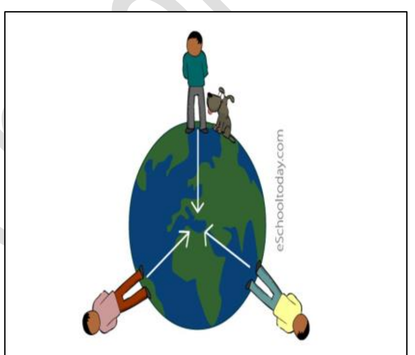
Concept 3

Energy as a system



Gravity

- **It is a force that affects everything that has mass**
- We **cannot see** gravity but we can observe its effect on objects
- All objects on or near Earth's surface are pulled (attracted) to the **center of Earth**



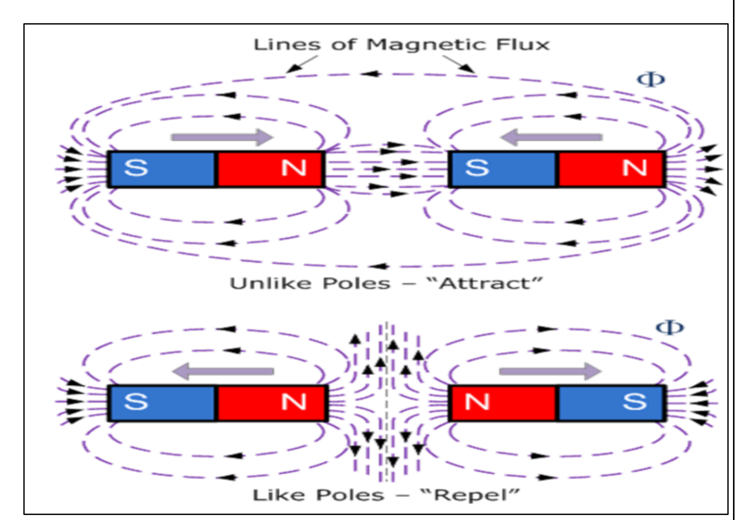
Factors affect the force of gravity:

1. **Distance**: as the distance between object and center of Earth **increase** the gravitational force **decrease**
2. **Mass**

Magnetism:

- Magnets are made of iron and other materials
- Magnets has force called **magnetism**
- **Magnetism** allows magnet to attract:

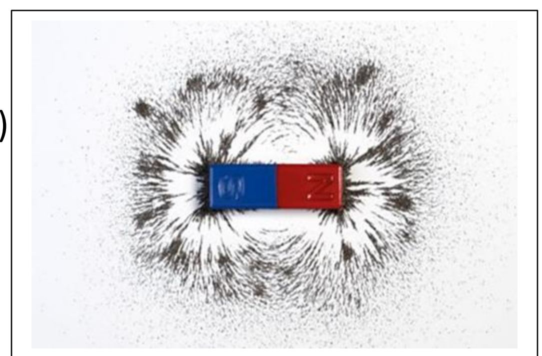
1) certain materials without making direct contact
2) attract or repel other magnets



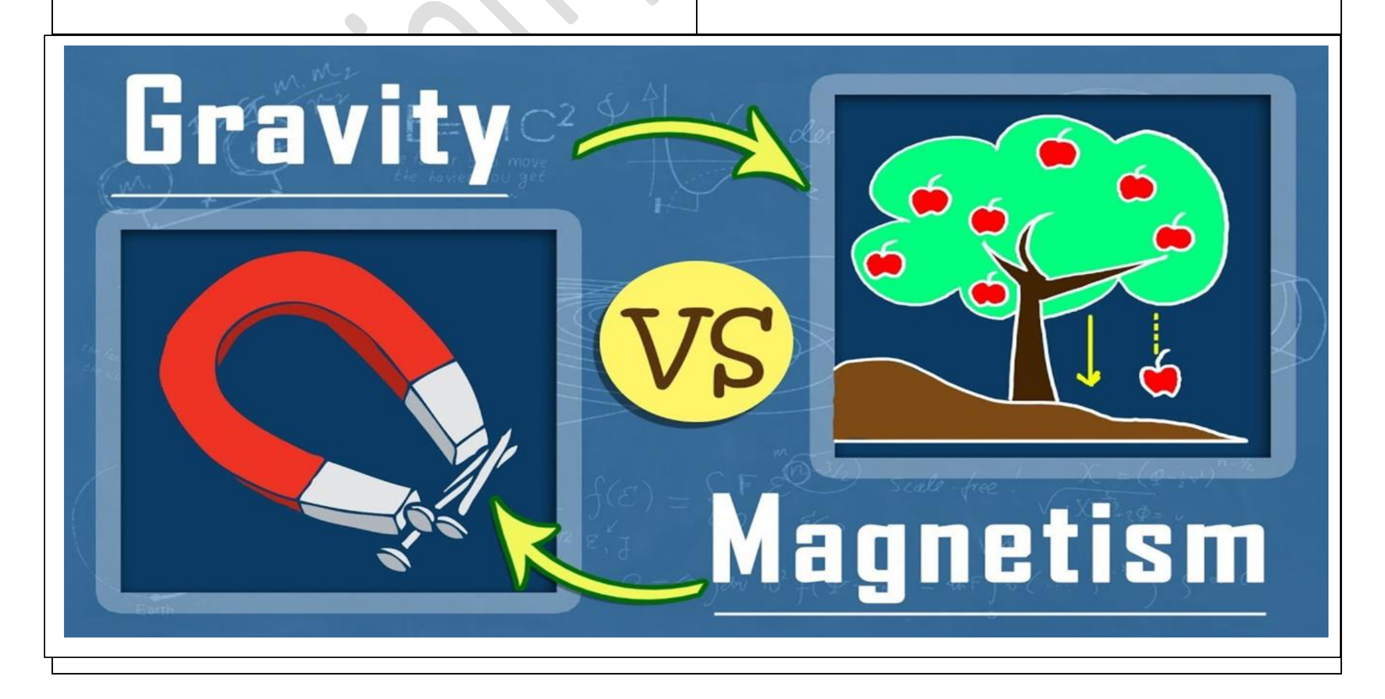
Magnetic Field:

- Magnetism of a magnet appears in an area around it known as **magnetic field**
- we **cannot see** the magnetic field
- **Iron filling** make us see the magnetic field

(make pattern near magnet that outline its magnetic field)

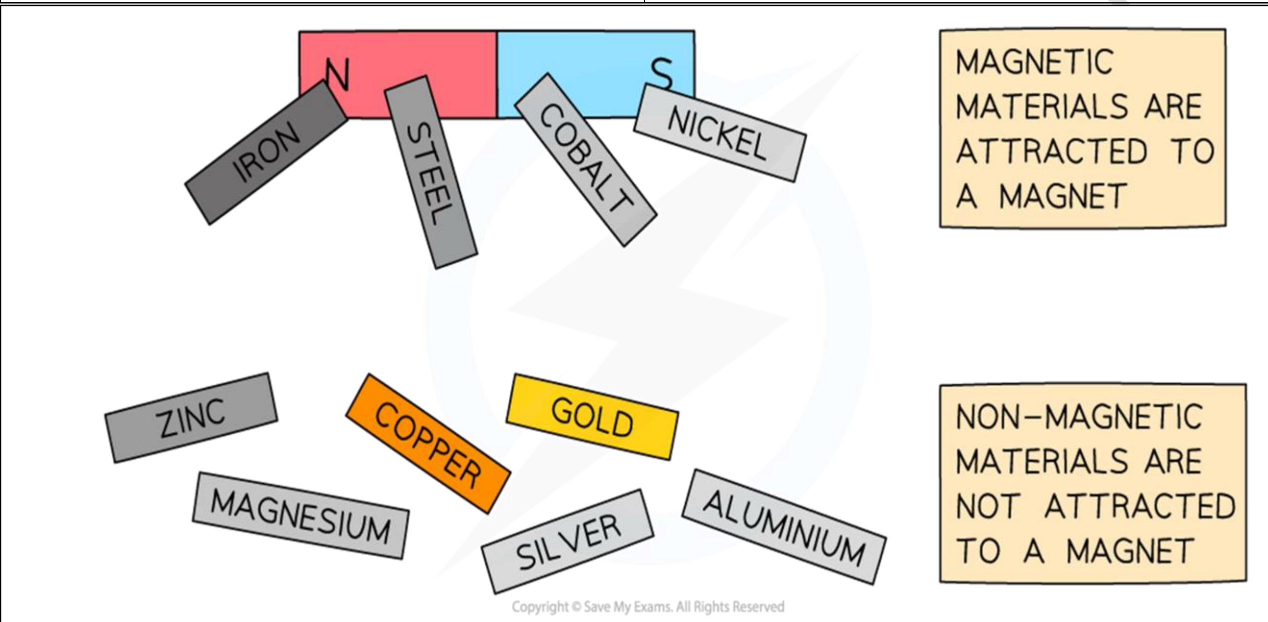


Gravity	Magnetism
Similarities • They are forces • Not necessary for objects to come to contact with one another to affected by gravity and magnetism	
Gravity • Attracts objects that has mass • Pull objects downward	**Magnetism** • Attracts certain materials • Pulling force: when it attracts objects or another magnet • Pushing force: when repel another magnet



Lesson 2

Magnetic material	Non-magnetic material
They are materials that attracted to the magnet	They are materials that are not attracted to magnet
Examples iron, nickel and cobalt	**Examples** Aluminum, copper, plastic, paper and wood



<u>**Classwork sheet**</u>

Complete:

1. The gravity of Earth is affected by 2 factors which are…………and………………
2. Gravity attracts any object that has ……………………
3. Copper and…………..will not attract to the magnet as they are…………..materials
4. Magnet attract some metals, such as………………..and…………………..
5. All objects are pulled toward Earth's ……………..due to……………force

Write the scientific term:

1. The area around the magnet in which its magnetic force appears
   (………..…………)
2. The materials that are attracted to the magnet (……………………)
3. The force that allows the magnet to attract some materials without direct contact
   (……………………)

Give reason:

1. When a ball is thrown into the air, it will stop moving upward and then falls down
   …………………………………………………………………………………….
2. Wood and copper are non-magnetic material
   ……………………………………………………………………………………..

Put (t) or (f)

1. Cobalt is an example of magnetic materials ( )
2. All magnets can be made of some materials like iron and glass ( )
3. Electricity and magnetism can work together ( )
4. Earth attracts all objects on its surface due to its great mass ( )

Homework sheet

Choose the correct answer:

1. Magnets can be made of……………..
   a) copper b) glass c) plastic d) iron
2. The area around the magnet in which its force appears is known as………..
   a)magnetic field b) magnetism c)electric current d) gravity
3. When you throw a ball upward it returns back to the earth due to……………
   a) gravity b)magnetism c) electricity d)mass and electricity
4. Gravity and magnetism are similar in that……………
   a)they are repulsion forces only
   b) they are attraction force only
   c) they are forces that attract all objects
   d) we cannot see them
5. …………is a magnetic material that is attracted to the magnet
   a) copper b) iron c)gold d)wood
6. All the following materials are magnetic materials Except …………….
   a) iron b) plastic c) nickel d) steel
7. Magnet affects certain objects like…………when they locate in its magnetic field
   a) wood and steel b)nickel and plastic
   c)iron and copper d)cobalt and steel

Write the scientific term:

1. The force of earth which attracts all objects on its surface to its center
   (……………………..)
2. The materials that are not attracted to the magnet
   (……………………)
3. The area around the magnet at which the magnetic materials are attracted to the magnet (…………………)

Give reason for:

1. Cobalt and nickel are considered as magnetic materials
   ………………………………………………………………………………..

Lesson 3+4



Electrical poles that support electric wires between cities and the wires inside walls are all examples of **Electric circuit**

Electric circuit is considered as a system as it consists of many components that work together

Generator: it changes **mechanical Energy** (Kinetic Energy) to **Electric Energy**

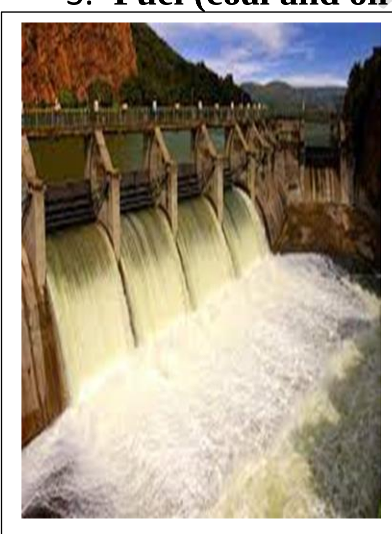
Generator used in lighting houses and operating electrical devices

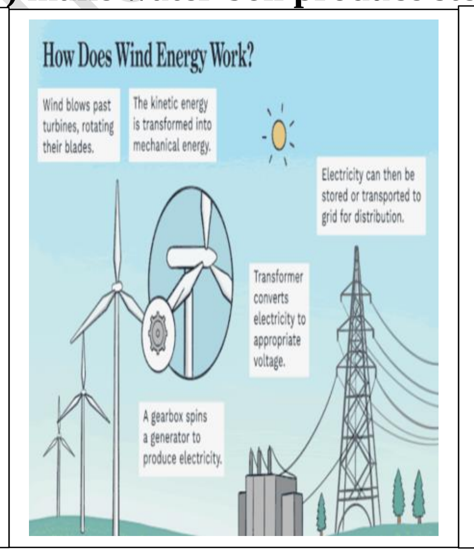
It consists of: 1) large magnet 2) coiled wires

Large magnet spin at a high speed and this create electrical charges on the coiled wires so electricity is produced

Different forces that make magnet spins to generate Electricity

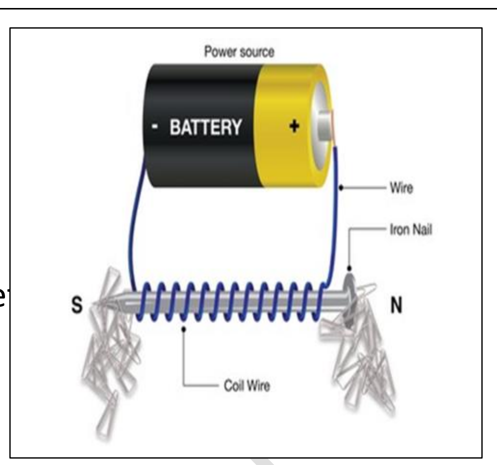
1. **Water in dams operates water turbines**
2. **Wind operates wind turbines**
3. **Fuel (coal and oil) make water boil produce steam**







Electricity and Magnetism can work together



- Electric current comes from movement of tiny charged particles through conducting wires
- Flows of electric current through a wire it forms magnetic effect around the wire (**Magnetic field**)
- If a wire wrapped around a metal core the magnetic field produced by flowing current gets stronger (strengthened) so it attracts iron nails

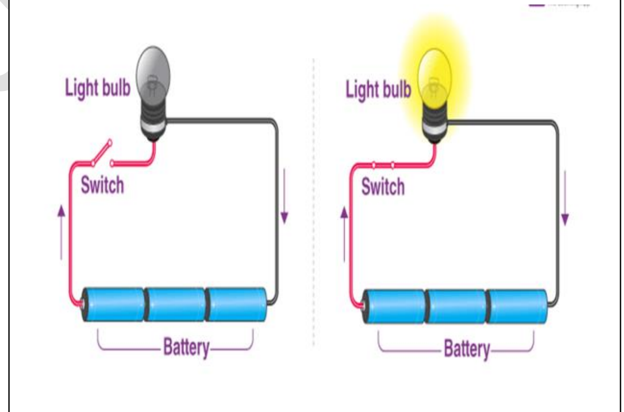
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Electricity: it is form of Energy that comes from a flow of Electric charges (**Electrons**) moving along path

Electric current: it is flow of Electric charges along closed path

Electric circuit: it is a path for transmitting an Electric current

It consists of:



1. Metal wire
2. Electric power source (Battery)
3. Switch
4. Electric device (lamp)

*To make the electric current flow through a circuit
It must be closed



*it must begin and end in the same place without any break



*in the electric circuit, there must be a source of electricity: **1) Battery**
2) Wall socket: it transfers electric current from power lines connected to the building

The switch: most common tool to open and close the electric circuit

Manual switch: such as a wall switch for lights
* when switch is closed it closes the circuit so electricity flows through the circuit
* when switch is opened it opens the circuit so electricity doesn't flow through circuit

Automatic switch: such as the internal switch on thermostat that adjusts the temperature inside devices such as the refrigerator

Electric conductors and Electric insulators

Electric conductors Good conductors of Electricity	Electric insulators Bad conductors of Electricity
They are materials through which Electric current (**Electrons**) floes easily **Examples** Water All metals (copper, aluminium)	they are materials through which Electric current (**Electrons**) does not flow easily **Examples** Rubber Plastic wood

Current safety

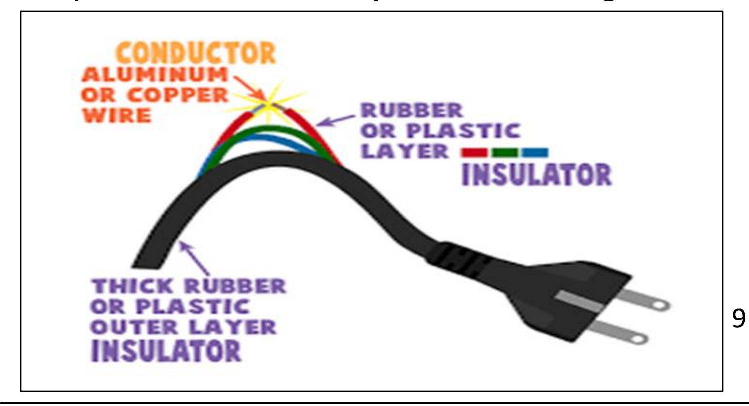
Wires are coated with Rubber or plastic as they are bad conductors of electricity **to protect us from Electric shock**

****TOUCHING** non insulated wire that an electric current flows through causes an electric shock and may cause death ??

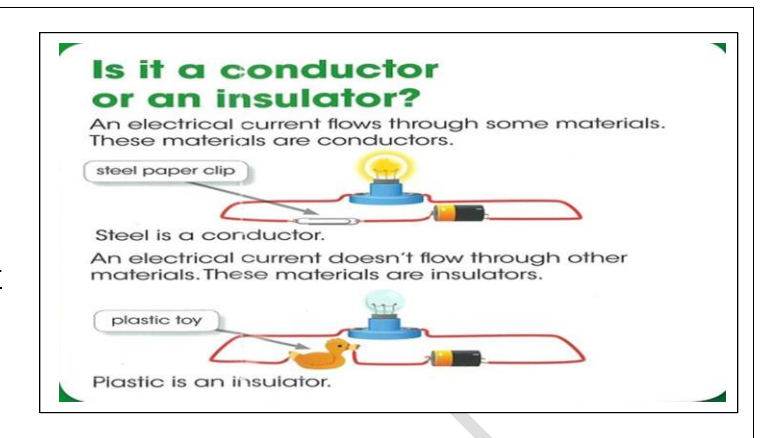
Because human body contains a lot of water which is good conductor of electricity

****electric wire** are wrapped in plastic (bad conductor) ??

To prevent electricity from moving from the metal wire into our hand



- **if a conductor is placed in a circuit with battery and light bulb, electricity will flow and lamp will light**
- **If an insulator is placed in a circuit with battery and light bulb, electricity will not flow and lamp will not light**



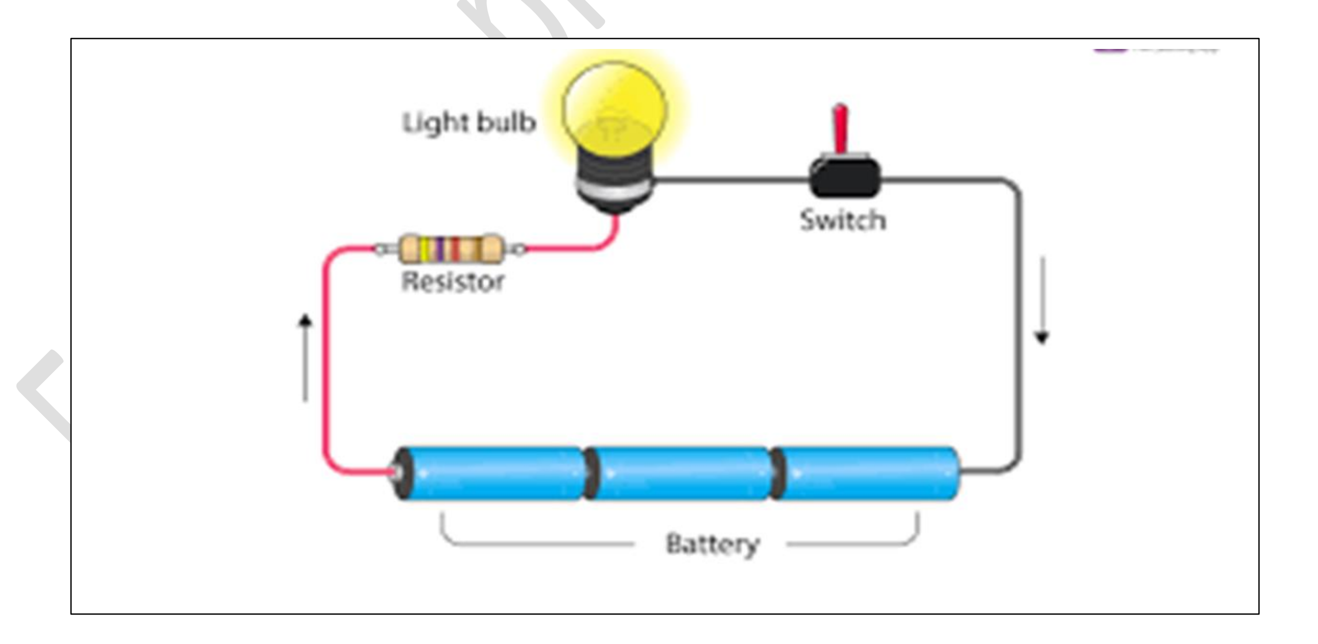
Importance of insularors:

* Insulators keep us safe from getting shocked by electric current?
As they stop the flow of electricity

Resistors: they are components of an electric circuit that limit the flow of electric current

Used to slow the flow of electrons through an electric circuit **to avoid** the damage of the components of an electric circuit

Found in 1) toasters 2) microwaves 3) stoves



Classwork sheet

Complete:

1. The generator consists of large……………….and……………….
2. The electric current can transmit in a path called……………..
3. There are materials known as …………that allow electrons to flow through such as…………………and……………..
4. Wood, ……………………and……………..are electric insulators
5. All metals like……………and……………are called………………
6. Electric wires are coated with………………….to protects us from…………..

Write the scientific term:

1. The device that changes mechanical energy into electric energy (………………)
2. The flow of electrons through an electric wires (………………)
3. A tool in the circuit that is used to open and close the circuit (……………….)
4. It is used to adjust the temperature inside some devices such as the refrigerator (……………….)

Give reason:

1. The electric circuit must contain a battery
   ……………………………………………………………………………..
2. All metals are considered as electric conductors
   ………………………………………………………………………………
3. Electric wires are wrapped in plastic
   ……………………………………………………………………………….

Homework sheet

Choose the correct answer:

1. Mechanical energy is converted into………..energy in generators
   a)light b)sound c) electric d)thermal
2. The flow of electric charges along a closed path causes………
   a)electric circuit b)light energy c) electric current d)sound energy
3. All the following materials are considered as electric conductors, **except**…………
   a) copper b)water c) rubber d) iron
4. Electric insulators like……………..
   a)copper b) iron c) aluminium d)plastic
5. A magnetic field can be formed when the electric current flows around……………
   a) plastic tube b)battery c) metal core d) a glass core
6. The electric wire can be made of……………
   a) wood b)plastic c)iron d)copper
7. Metallic materials are considered electric……………
   a)insulators b)energy c)circuits d)conductors

Put (t) or (f)

1. Electricity can be produced from magnetism ( )
2. Water in dams are used to operate wind turbines ( )
3. All materials allow electric current to flow through them ( )
4. Copper and aluminium are electric conductors ( )
5. If your hand touches an insulated wire you will be shocked by electricity ( )

Give reason:

1. Electric wires are made of copper
   ……………………………………………………………………………………….
2. Electric generators have a great importance in our life
   ………………………………………………………………………………………..

Lesson 5+6

Series and parallel connection

Series circuit	Parallel circuit
*All components must be connected in single loop (one path) *Electric current can only flow along one path *We can operate more than one lamp but if **one blows out** the others **will not work**	*all components are connected in 2 or more different branches of the circuit * Electric current can flow in different paths (more than 1 path) *we can operate more than one lamp, if **one turned off the other lamp will remain light**
Series circuit	Parallel circuit

Parallel circuits are found in houses so we can operate more than one device at the same time
if we turn off one device the others continue work

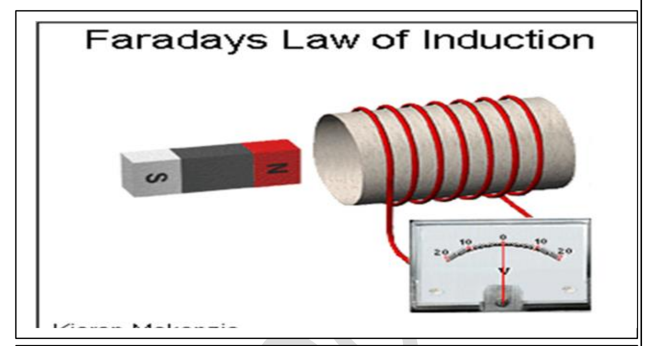
Energy source is the power plant which has generators that push out electricity
***electricity travels along conductors called** power lines **into all kinds of electric devices in house, businesses and factories**

Galvanometer: it is device used to detect the flow of small electric current

coiled wire around hollow cylinder and connected to galvanometer

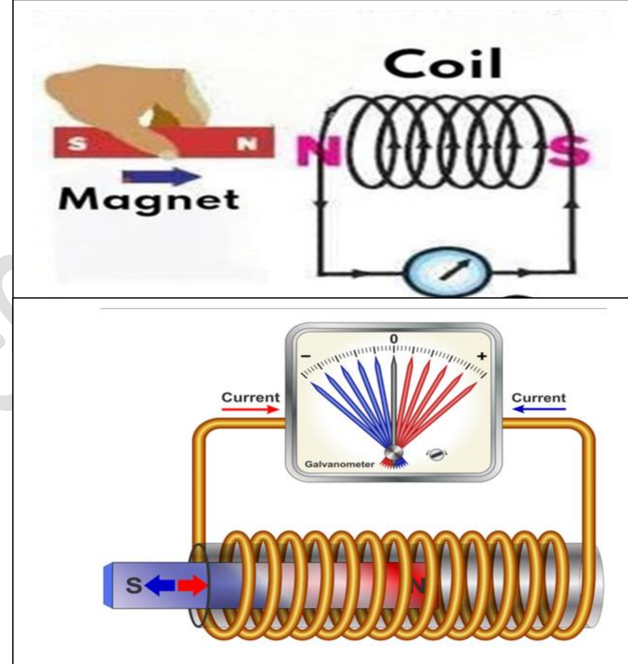
1. **When magnet is at rest**

needle of galvanometer not move (no electric current)



2. **When magnet moved toward and into coil**

needle of galvanometer move to one side
(electric current flow)



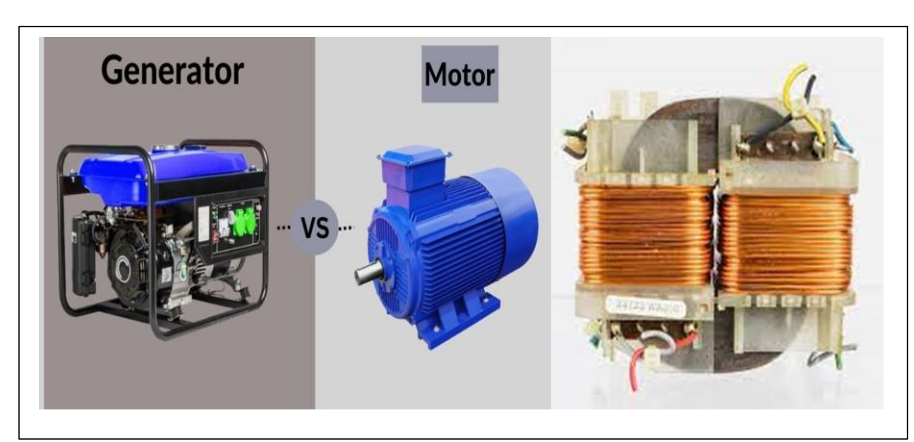
3. **When magnet moved rapidly inside the coil**

needle of galvanometer moved rapidly
(electric current increases)

By increasing the number of loops in coil the movement of needle of galvanometer increase (electric current **voltage** will increase)

Relation between magnetism and electricity

1) **Electric motor**
2) **Electric generator**
3) **Electric transformer**



Natural pacemaker

- Heart is muscle beats All the time (consistently)
- Heart has natural pacemaker creates electric current that sends it out through heart causing the heart to contract\
- When the natural pacemaker starts to fail, sometimes we need an artificial pacemaker **to keep the heart beating correctly**

Artificial pacemaker

- It is device operates with battery put in chest **to keep heart beating correctly (regular interval)**
- It is used for 60 years

Consists of:

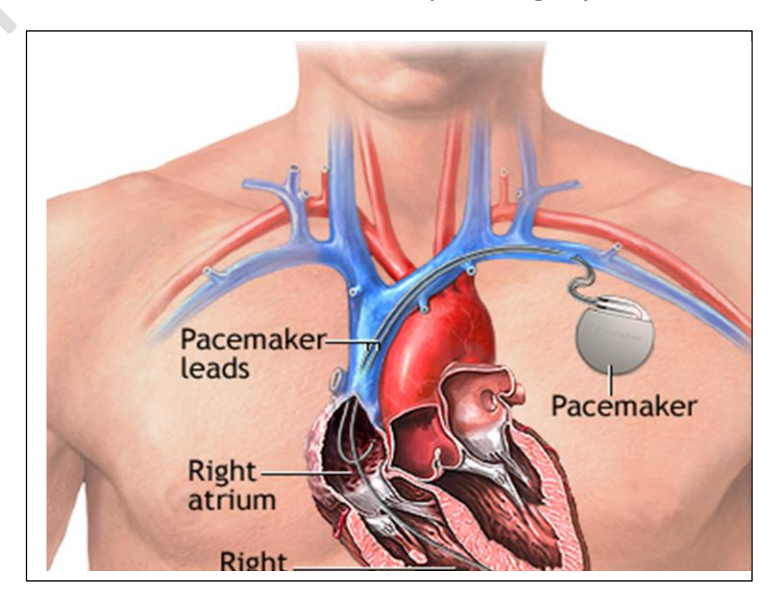
1) battery 2)insulated wire 3) motherboard

Future of pacemaker:

Artificial pacemaker has a built-in antenna **to send information to doctors (physicians), so they know how the heart is behaving**

Artificial pacemakers are getting more advanced by the year and becoming smaller too

Today doctors can place a tiny effective pacemaker in the heart with a simple surgery



Classwork sheet

Complete:

1. Rubber is an electric…………………, while copper is an electric……………………
2. Electric wires are coated by…………….as it is an electric insulator
3. Electric circuits in houses are connected in……………………..way
4. Microwaves and electric stoves contain………………that are used to slow the electric current
5. The heart has a natural…………….which causing the heart to contract

Put (t) or (f)

1. The artificial pacemaker should contain a battery to do its function ( )
2. The heart is important in our body as it helps in food digestion ( )
3. In the series connection, the electric current can flow in different branches ( )
4. Towns and cities are parts of an electric circuit ( )
5. There is no relation between magnetism and electricity ( )

Write the scientific term:

1. A device can be used to detect the flow of small electric currents (………………………….)
2. Material that don't allow electrons to flow through them easily (…………………………..)
3. A device inserted into the chest to stimulate the heart to beat regularly (…………………………..)

Give reason for:

1. The heart has a natural pacemaker
   ………..
2. Some electric circuits contain resistors
   ……….

Homework sheet

Choose the correct answer:

1. Electricity can flow through……………………..

a) electric conductors b) electric insulators c)wooden bar d)eraser

2. Resistors are found in all the following devices, **except**…………….

a)toasters b)microwaves c)electric stoves d)batteries

3. In a …….., the electric current can flow through different branches

a)series circuit b) parallel circuit c) resistor d) microwave

4. The ……..is a muscle that beats inside the human body to push the blood to all body parts

a) stomach b)brain c) heart d) hair

5. The artificial pacemaker is inserted into the…………….of the human body

a)brain b)chest c) legs d) hands

Write the scientific term:

1. A muscle in the human body that beat regularly to push the blood inside the body (……………………….)
2. The type of electric circuit that are found in houses (……………………….)
3. Materials that allows electrons to flow through them easily (……………………….)

Give reason for:

1. Scientists provide the new artificial pace maker with built-in antenna
   ………………………………………………………………………………………………………

What happens if?

1. Electric circuit in houses are connected in series
   ……………………………………………………………………………………………………..

Unit 2 Concept 1

Lesson 1

Everything around us is made of matter

Matter can change from one state into another

Atom: it is the smallest building unit of matter

Molecule: group of atoms bound together

Thermal Energy: it is the movement of particles of an object

	solids	Liquids	Gases
Shape and volume	Have fixed shape and volume	Have fixed volume **Variable** shape	**Variable** shape and volume
Molecules	Held together tightly in their position	Held together more loosely than solids	Are not held together **as** they are much more loosely than liquids
Movement	Vibrate around their places *particles of solid matter move slowly, so they have least thermal energy	Move faster than solids and slide over each other *particles of liquid matter more faster they have moderate thermal energy	They move independently in all directions *particles of gas matter move very fast, so they have most thermal energy
	SOLID	LIQUID	GAS

Lesson (2)+(3)

Kinetic energy: Is the energy that molecules and atoms of as substance has due to their motion

*Thermal energy relates to kinetic energy of its molecules and atoms
-Thermal energy of a substance is the total sum of kinetic energy of its molecules and atoms

*the molecules of solids are not moving as fast as molecules of liquids, so solids have less thermal energy than liquids.

*thermal energy (heat) transfers from one substance to another if they have different temperatures

*heat flows from a hotter substance to a colder substance.

- if you hold ice cubes in your hand that has more thermal energy than the ice cubes, so the ice cubes will melt (why)?

- Because heat flows from your hand (hotter substance) to the ice cubes (colder substance)

Temperature
it is a measure of the average kinetic energy of molecules and atoms of a substance

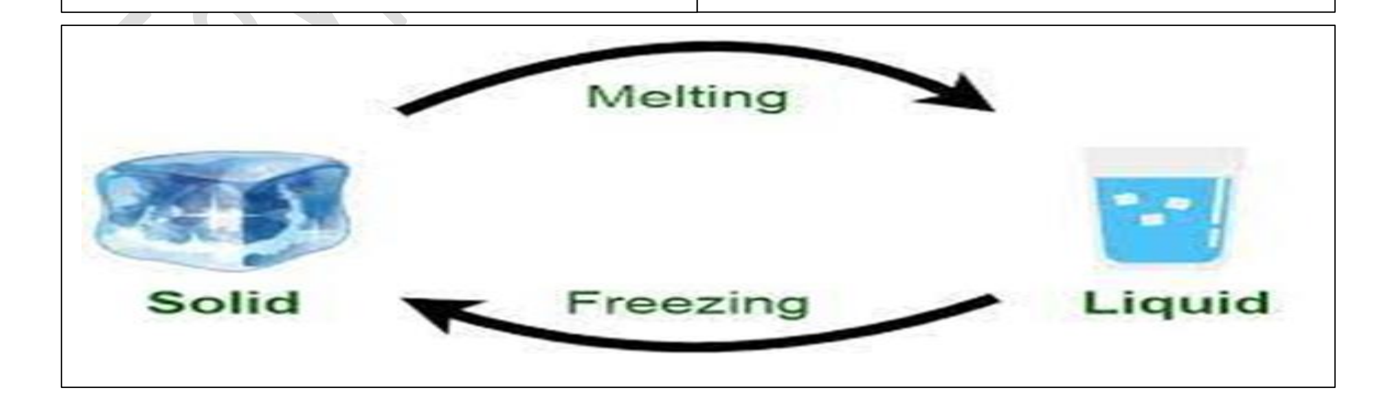
When a substance is heated:

1- Thermal energy is transferred to the molecules of the substance.
2- The molecules gain thermal energy and move faster.
3- The kinetic energy of the molecules increase.
4- The temperature of substance increase

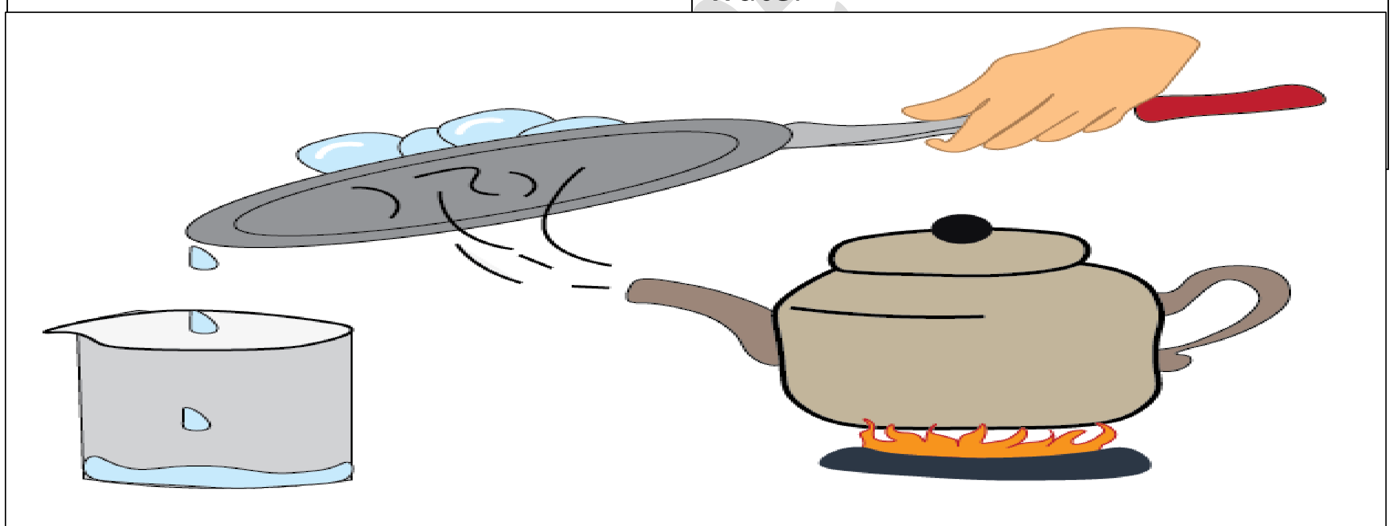
Changes of state of matter

When the thermal energy of a matter changes, the matter will changes from one state to another.

"melting"	"Freezing"
-Changing matter from solid state to liquid state *on heating a solid matter: **1-** The thermal energy of molecules of solid matter **increase** 2- -The force that holds these molecules together **decreases** so; they vibrate **faster**. 3- Molecules start to move away from each other, so the solid matter changes to liquid matter. Example: Ice changes to water	-changes matter from liquid state to solid state. * On cooling a liquid matter: 1- The thermal energy of molecules of liquid matter **decrease.** 2- The force that holds these molecules together **increases** so; they vibrate **slower**. 3- Molecules start to get close together so; the liquid matter changes to soli matter Example: water changes to ice



Evaporation	Condensation
- Changing matter from liquid state to gas state *On heating a liquid matter. 1- The thermal energy of molecules of liquid matter **increase** 2- The force that holds these molecules together **decrease** so; they vibrate **faster** 3- Molecules start to move away from each other so the liquid matter vaporizes into gas matter. **Example:** water changes to water vapor	- Changing matter from gas state to liquid state. *On cooling a gas matter. 1- The thermal energy of molecules of gas matter **decrease** 2- The force that holds these molecules together **increases** so; they vibrate **slower**. 3- Molecules start to get close together so the gas matter changes **Example :** water vapor changes to water



Hot molecules: Have more thermal energy and kinetic energy and move faster and color take less time to spread out in it

Cold molecules: have less thermal energy and kinetic energy and move slower and color take more time to spread out in it

<u>Glassblowing</u>

Manufacturing of glass depend on changing from one state to another state

- **When glass is heated at very high temperatures it changes into molten glass**
- **<u>Glassblowing</u> is a process to form different shapes of glassware by using hollow tube contains molten glass at one end of its ends**
- **<u>Molten glass</u> could be blown by person from one end of the hollow tube and make different shapes of molten glass**
- **<u>Molten glass</u> is cooled forming different shapes of glassware**





Classwork sheet

Complete:

1. Matter consists of small building units called…………….which consist of smaller units called………………….
2. Water has……………..volume and………………shape
3. The transfer of…………… energy is called heat
4. The temperature at which solid changes to liquid is known as…………..point
5. Thermal energy of a substance is the total sum of……………energy of its molecules and atoms
6. The………………….point and…………..point are physical properties
7. As temperature……………….the kinetic energy of molecules increases
8. Changing of matter from…………state to ……..state is called evaporation
9. A drop of food coloring added to a hot cup of water will spread out…………..than in cold water

Give reason:

1. Particles of steam have higher thermal energy than particles of water
   …………………………………………………………………………………………
2. Ice melts when it is put in a hot cooking pan
   …………………………………………………………………………………………..
3. Food coloring takes less time to spread out in the hot water than in cold water
   …………………………………………………………………………………………..

Write the scientific term:

1. It is a group of atoms bound together (………………………..)
2. The state of matter that has fixed volume and shape (……………………….)
3. It is the measure of the average kinetic energy of molecules and atoms of a substance (………………………)
4. It is the change of matter from liquid state to solid state (……………………...)
5. A process in which liquid molecules move slower and change to another state (…………………….)

Put (t) or (f)

1. The boiling point of water is less than boiling point of mercury ( )
2. Molecules of solids move faster than molecules of liquids ( )
3. Glass can be melt at very low temperature ( )
4. Gases have variable shape and volume ( )

Homework sheet

Choose the correct answer:

1. The molecule is composed of very small particles, called……….
   a) cells   b) atoms   c) mixture   d) compound
2. The…………….energy is related to the motion of particles of a matter
   a)chemical   b)potential   c)light   d)thermal
3. Temperature is a measure of the…………..energy of molecules of a substance
   a)kinetic   b)potential   c)light   d)chemical
4. Changing from gas to liquid is called………………….
   a)melting   b)evaporation   c)condensation   d)freezing
5. Objects with more thermal energy have………………..kinetic energy
   a)more   b)less   c)the same   d)no

Write the scientific term:

1. It is the smallest building unit of matter (………………….)
2. It is the change of matter from solid to liquid state (………………….)
3. It is the change of matter from gas to liquid state (……………………)
4. A process in which liquid molecules move faster and change to another state (……………………..)

Give reason for:

1. Evaporation and condensation are two opposite processes
   ……………………………………………………………………………………………

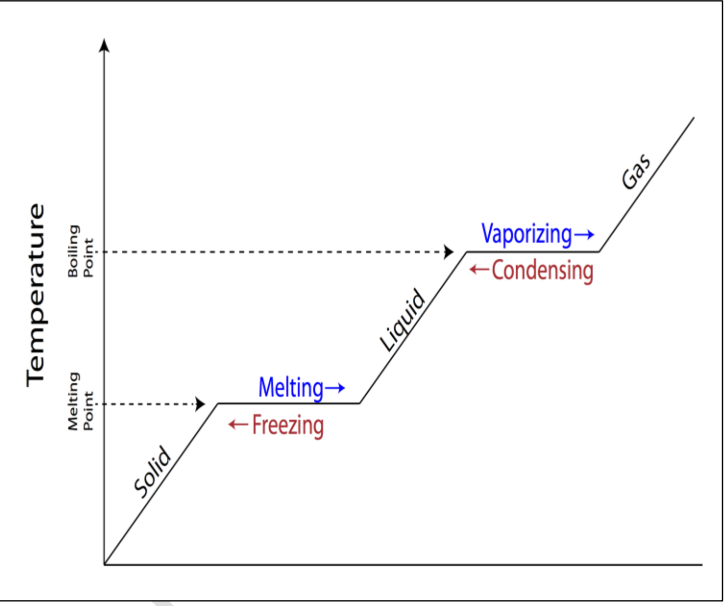
What happen if?

1. You touch a hot cup of tea
   ……………………………………………………………………………………………

Put (t) or (f)

1. Matter can be changed from one state to another (   )
2. All matter contain thermal energy (   )
3. Heat flows from a hotter substance to a colder substance (   )
4. The melting point is considered as physical properties (   )
5. Hot water molecules have more kinetic energy than cold water (   )
6. Kinetic energy is the energy of motion (   )

Lesson 3+4



Melting point: it is the temperature at which matter changes from solid state to liquid state

Boiling point: it is the temperature at which matter changes from liquid state to gas state

(Boiling and Melting points are physical properties)

- If solid substance is heated, it absorbs thermal energy and moves faster (increase in kinetic energy)
- Decrease the force that bond (held) molecules together so the spaces between them increase and changes to liquid
- If liquid substance is heated, it absorbs thermal energy and moves faster (increase kinetic energy)
- This decrease the force that held the molecules together so the spaces between them increases and changes into gas

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Melting point of ice is **0˚c**

Boiling point of water is **100˚c**

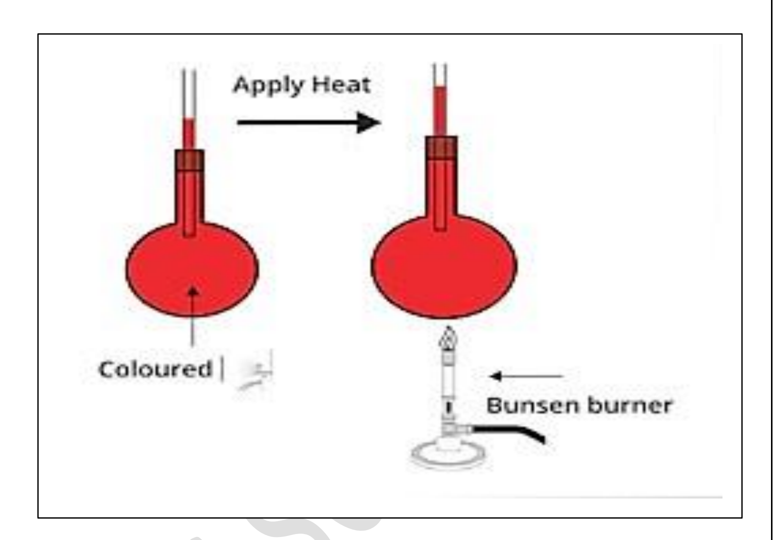
Boiling point of mercury is **357 ˚c**

Thermal expansion

When we cool matter the spaces between its molecules decrease and come close together (**Contract)**

When we heat matter the spaces between its molecules increase and moves away from each other (**Expansion)**

Examples of contraction and expansion



1) Thermometer:

Some Contain alcohol (liquid) mixed with color

- If it is placed in hot substances the temperature of alcohol increases and the spaces between its molecules increase so the molecules of alcohol spread out and **Expand**
- If it is placed in cold substances the temperature of alcohol decreases and the spaces between its molecules decrease so the molecules of alcohol come close together and **Contract**

---

2) Jars:



sometimes it is hard to open the lid (cover) of jar
The lid of jar is made of **metal**
Hot water increase the temperature and space between molecules increase and it expand so, it open easy

3) a) Bridges

Are made up of steel (metal) and concrete
When bridges are exposed to hot weather
Temperature of metal increase and space
between them increase so, it expand

Expansion joints: to keep bridges safe from buckling
(bending) when they expand at high temperature
**** To keep bridges safe over time**

---

b) Railroad

Railroad tracks are made of iron
Engineers leave small spaces between the tracks of railroad **to** expand in hot weather
without being **bent??**
To avoid train accidents





Classwork sheet

Complete using the words below:
(Expand- contract- faster- slower- increase- decrease- near to- away from- thermometer)

1. Cooling causes matter to……….., and causes particles to move…………
2. When a liquid is freezed, the spaces between its molecules……………causing their movement……………..each other
3. Heating causes matter to……….., and causes particles to move…………………..
4. When a liquid is heated, the spaces between its molecules…………..causing their movement……………each other
5. Expansion and contraction of liquids explain how a ……………………..works

Give reason for:
1. Engineers use expansion points in the designing of bridges
   …………………………………………………………………………………………
2. Pouring hot water over a metal lid of a glass jar makes it easier to open the jar
   ………………………………………………………………………………………….
3. Matter expands when its thermal energy increases
   ………………………………………………………………………………………….

Write the scientific term:
1. A device used to measure the temperature (……………….)
2. The increase in the volume of a material as its temperature increases (……………..)
3. The state of matter which changes into liquid by heating (………………)
4. It is the state that doesn't have fixed shape and volume (……………)

Put (t) or (f)
1. Engineers use expansion joints to keep bridges safe ( )
2. Railroad are made of iron ( )
3. No spaces are left between railroad tracks ( )
4. When objects lose heat, they contract ( )
5. When a liquid is cooled, it may change to gas ( )

Homework sheet

Choose:

1. As a result of heat flow through metals, they……………
   a) Expand b)contract c)get smaller d)are not effected
2. The temperature………………….during the melting of solids
   a) Decrease b) increases c) does not change d) may increase or decrease
3. Materials…………on heating
   a)expand b)contract c)compress d)doesn't change
4. Railroad are made of …………….
   a)glass b)coal c)plastic d)iron
5. Engineers leave………..spaces between railroad tracks
   a)small b)very large c)large d)no

Give reason for:

1. Small spaces are left between the railroad tracks
   ………………………………………………………………………………………………….

Write the scientific term:

1. The decrease in the volume of a material as its temperature decreases
   (……………………….)
2. It is the decrease of the size of a substance due to decreasing of its temperature
   (………………………..)
3. It is the state of matter that has a fixed shape and spaces between its molecules are very small (………………………..)
4.

Concept 2

Lesson 1+2

There are 2 types of materials according to transfer thermal energy

Thermal conductors **Good conductors**	Thermal insulators **Bad conductors**
They are materials that allow thermal (heat) energy to transfer through Or They are materials that allow heat to travel freely through them	They are materials that resist the transfer through Or They are materials that slow down the heat transfer **N.B: it can't prevent the transfer of heat completely, but it slows down the heat transfer through them**
EX: metals (copper, iron, aluminum)	**EX:** Air, plastic, wood, glass

If you touch a metal doorknob, you fell that it is cooler than wooden door?



Because heat energy transfers faster from hand to metal **(good conductor)** than hand to wood (**bad conductor)**

Iron in electric iron is good conductor
(heat transfer to cloth to iron it)

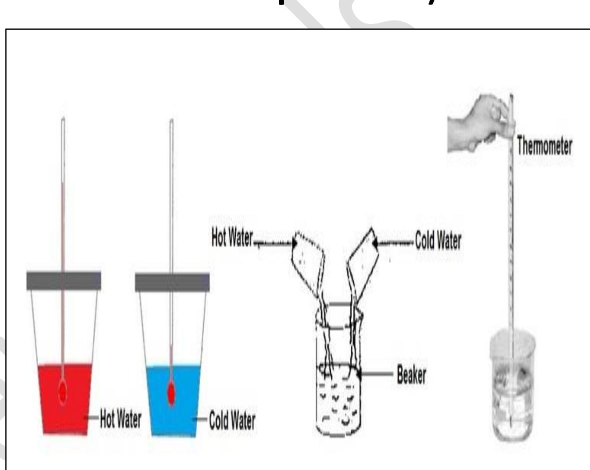
Plastic in electric iron is bad conductor
(you can hold it without feeling hotness)



Properties of heat

1. **Heat is essential component in our life**
2. **Measuring unit of heat calorie**
3. **Heat cannot be lost but it only transferred**
4. **Heat transfers from hotter object to cooler object**

(Until both reach the same temperature that is known as **thermal equilibrium)**



- **when mixing hot object with cold object their final temperature at thermal equilibrium almost equals their average temperature**
- **Some cases the final temperature when mixing hot and cold object is less than their average temperature (**as heat transfer to air or container)
- **The molecules of hotter substance become slower after mixing**
- **The molecules of cooler substance become faster after mixing**



Average temperature = $\frac{\textbf{temperature of object (1)+temperatureof object(2)}}{\textbf{2}}$

Heat transfer through different material



The handle is warmer closer to pan and cooler as we go away from pan
Because heat travels very slowly along the handle

- the wooden handle warms up **faster** than plastic handle

Lesson 3

Heat can transfer by three different ways

conduction	Convection	Radiation
Heat transfers when 2 solid objects touch each other	Heat transfers due to movement of liquid or gas • **Hot** water moves up • **Cold** water moves down	Heat transfers through gas and space Heat of sun transfers to us by radiation

The speed of heat transfer between objects increases when:

1. The difference in temperature between objects **increase**
2. Surface area of objects **increase**
3. Time of contact between objects **increase**

Meteorologists (scientists who study weather) must understand **convection** and **radiation** (to predict weather)

Engineers must understand **conduction**, **convection** and **radiation** (to design new products and sidewalks (cooler and shadier))

Classwork sheet

Complete:

1. If you hold a cup of cold water, heat transfers from……………………to…………………………
2. Thermal…………………………materials slow down the heat transfer through them, such as ……………….. And……………………….
3. The handle of an electric iron may be made of……………….,while ……………..is used to make lower part that is used in ironing clothes

Scientific term:

1- They are materials that allow thermal energy to transfer through (………………………)
2- It occurs when heat transfer stops between two objects reach the same temperature (…………………………………..)
3- They are scientists who study the weather (…………………………………)
4- The way by which the heat is transferred through gases and space (………………………………)

Put (√) or (×):

1- Molecules of cold or hot substance always move ( )
2- Heat transfers between two objects that have the same temperature ( )
3- Thermal conductors are good conductors of heat ( )
4- When you add some cool water to hot tea the molecules of tea will move slower ( )
5- When kinetic energy of molecules decreases, they vibrate slower ( )
6- Heat transfers by conduction through solids only ( )

Give reason for:

1. The lower part of the electric iron is made of iron
   ……
2. The vibration of molecules of a matter increases when it becomes warmer
   ……

Homework sheet

Choose:

1. -if heat transfers to a lower temperature object, its molecules will …………

a-stop moving   b- move slower   c- Move faster   d- not be affected

2. The measuring unit of heat is called …………….
   a- Calorie   b- gram   C-kilogram   d- meter
3. Heat transfers from an electric heater to your body by ………………when you stand nearby it

a-radiation only   b- radiation and conduction

C-conduction only   d-conduction and convection

4. Meteorologists are scientist who study………………………
   a- Weather   b-rocks   c-water   d- cells
5. ………………occurs when heat transfer stops between 2 objects as they reach the same temperature
   a- Calorie   c- heat flow
   b- Sound equilibrium   d-thermal equilibrium

Write the scientific term:

1. They are materials that resist the transfer of thermal energy (………………………)
2. It is the measuring unit of heat (………………………)
3. The way by which the heat is transferred through solids only (……………………….)

Give reason:

1. Glass and wood are bad conductors of heat
   ………
2. You feel heat, when you touch a metal spoon placed in a hot cup of tea
   ……….

Lesson 4

Law of conservation of mass:

Mass of substance does not change when it changes from one state to another

- If any liquid substance changes into gas state, its mass does not change after evaporation even we don't see its gas state
- If you put a plastic cup of juice in a freezer it freezes but its mass doesn't change
- No matter is destroyed or created but it just changes from one state into another

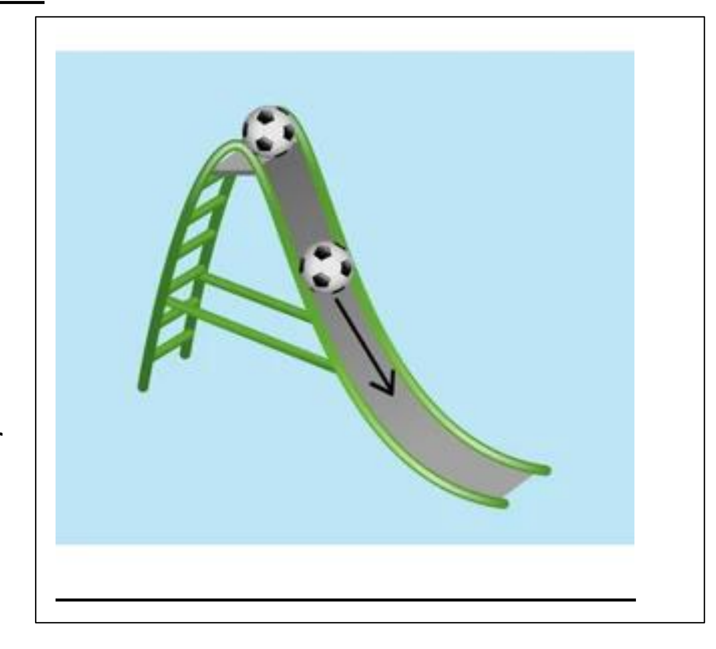
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If you have 100 gm. of popcorn after cooking it they become 97 gm.
(due to evaporation of water during cooking)



Lesson 5

- Ball at the top of the track has the most **potential energy**
- As it moves down **potential energy** changes into **kinetic energy**
- Some **kinetic energy** changes into **thermal energy** (due to **friction** between track and ball) that decreases the speed of the ball so, it doesn't reach the end of the track
- If the ball was larger it will move down faster because it has larger mass so it gains more kinetic energy



Lesson 6
Properties of some new materials

Every material is useful for some purpose not for all purpose, so scientist try to choose the most useful and suitable materials with some useful properties such as flexibility and conducting heat to make the products that people want

- **Scientists develop new materials, they study the structure of molecules of materials to understand their chemical structures**

Some materials are used in making smart clothes that can:

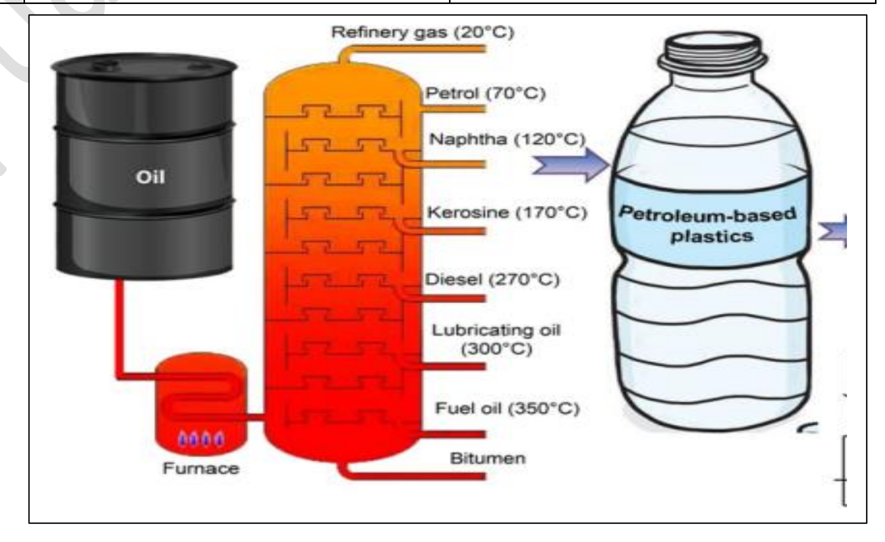
- Control your body temperature
- Light up in the dark
- Keep themselves clean

Mixing different materials:

- **Steel:** mixture between iron and other elements
  it is strong and lasts for a long time
- **Concrete:** mixture of rock, sand and water\ it is liquid until it dries it become hard \it is used in building and bridges as it is very strong

Material created due to chemical change: properties of new materials differ from properties of original materials

material	Petroleum (original)	Plastic (new)
properties	Liquid Burns easily	Solid Resists burning



Materials are created by mixing at high temperature:

Shrink wrap: when add heat to plastic to make it shrink



Glass: is made from sand, limestone and soda ash (sodium carbonate)
this mixture is heated in hot furnace (oven) it melts and changes into glass that become hard when it cools

Class work sheet

Complete:

1- The mass of ice cream before melting is ……….…………..its mass after melting
2- Energy can …………………. from one form to another
3- Steel is made of a mixture of…………and other elements, while concrete is made of a mixture rock ……….….and ……………..
4- Matter neither be………………………or………………., but it just……………….from one form to another
5- When a car moves down a hill its……………energy changes into……………energy

Write the scientific term:

1. A material consists of, limestone and soda ash (…………………….……)
2. The mass of a substance doesn't change when this substance changes from one state into another (…………………….….)
3. A form of energy stored in an object when it is placed on the top of a ramp (………………………….)
4. It is the original material of plastic (………………………….)

Give reason for:

1. The mass of ice cubes before melting equals to their mass after melting
   ……………………………………………………………………………………………………….
2. Due to friction force the tires of a moving car becomes hot
   ……………………………………………………………………………………………………….
3. Properties of plastic are differ from properties of petroleum
   ……………………………………………………………………………………………………….

Homework sheet

Choose:

1- …………..is the best material to make handles of cooking pots , as it doesn't warm fast
   a- Iron   b- plastic   c- wood   d-copper
2- The mass of substance doesn't change when this substance changes from one state into another, this is the law of conversation of ………………..
   a- Mass   b-energy   c- volume   d- state
3- When an object stops on the top of a ramp it stored ………….energy
   a- Kinetic   b- light   c- potential   d-sound
4- To make clothes we can use …………….
   a- Steel   b- concrete   c- hard fabric   d-flexible fabric
5- Plastic …………………………………..
   a- Is a liquid material   c- burns easily
   b- Is originated from petroleum   d- is a gaseous material

Give reason for

1- Plastic is better than wood to make the handle of cooking pots

   ………

2- Decreasing the mass of popcorn grains after cooking them

   ………

Write the scientific term:

1- A form of energy that gained or lost by the matter to change its state
   (………………………………)
2- A mixture of rock, sand and water which becomes hard after it dries
   (……………………………….)